# REPORT

OF

# THE ALCOHOL COMMITTEE

**Vide RESOLUTION No. Ch. Ind. 33(11)/52**
**Dated 11-10-1955.**

**OF THE**
**MINISTRY OF COMMERCE AND INDUSTRY**
**1956**

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# REPORT OF THE ALCOHOL COMMITTEE

## CHAPTER I.

## INTRODUCTION AND SCOPE OF THE COMMITTEE'S WORK

### "Power Alcohol" and "Industrial Alcohol"

Alcohol, unless otherwise qualified, refers invariably to Ethyl Alcohol, When used for industrial purposes, Ethyl Alcohol is generally of 96% strength and is referred to as "rectified spirit" when used pure, and "denatured or specially denatured spirit" when treated with small quantities of chemicals to render it unfit for potable purposes. The term 'power alcohol' is applied to Ethyl Alcohol of suitable quality which permits its use as a motor fuel in admixture with petroleum fractions. It is necessary that ethyl alcohol should have a strength or composition greater than 99.5% with less than 0.5% of water, if its mixture with petrol is to remain homogenous during its transport and use. Another important criterion is that the cost of production of alcohol should be low in order to ensure that, after mixing it with petrol, the price of the mixture is not increased. Power alcohol was used for the first time in India in 1940 and with the encouragement provided by the Indian Power Alcohol Act 1948, its production has now reached 10 million gallons a year. Such use of alcohol as motor fuel results in a small saving in foreign exchange and helps to maintain a ready source of indigenous motor fuel during times of emergency.

### Context of the present enquiry.

2. With the substantial growth of the sugar industry that is expected to take place during the second and third Five-Year Plan periods, increasing amounts of alcohol can be produced within the country. There is no doubt that it should be possible to absorb all such alcohol as power alcohol; but latterly a feeling has developed that a better use of alcohol might be as an industrial raw material for the production of diverse chemical products. Some of these products are the plastics, viz., polyethylene, polystyrene, cellulose acetate and polyvinylchloride; solvents, viz., butanol, ether and acetone; an insecticide like D. D. T. and synthetic rubber. The availability of cheap alcohol is a national asset that must be utilised for the production of such chemicals, particularly in view of the fact that, so far, the alternative raw materials commonly employed in their production, viz., petroleum crudes or natural gas are not available to the extent necessary at suitable locations in India. Unfortunately, a considerable number of difficulties have stood in the way of employing alcohol as an industrial raw material to any large extent. The principal difficulties have been as follows :—

(1) The State Governments resort to levies such as vend fees, permit fees and excise duties even on alcohol used for industrial purposes.

(2) Present excise regulations are a legacy of the past when alcohol was consumed essentially in the form of alcoholic liquors. Some of these regulations are often times a deterrent to the use of alcohol as an industrial raw material.

(3) With the extension of the policy of prohibition, considerable anxiety is felt by some State Governments that the free use or availability of alcohol as a raw material for certain industries might lead to the abuse of prohibition laws, and, therefore, these State Governments are reluctant to the relaxation of control over the free handling of alcohol necessary to encourage the production of chemicals based on it.

### Appointment of the Committee.

3. These difficulties have assumed importance recently in the context of the efforts being made during the last few years to manufacture products based on alcohol and there is a feeling that if the alcohol-based industries are to be developed in the most rational way, it is essential that the conditions governing the production and use of alcohol should be examined from all points of view and modified to the extent necessary.

The Government of India, therefore, appointed in October 1955 the "Alcohol Committee", vide copy of Resolution at Appendix I, to examine the question in all its aspects and to recommend measures for increasing the production of alcohol in the country and for its rational utilisation for various purposes. The Committee was constituted as under:—

| | |
|---|---|
| Dr. A. Nagaraja Rao,<br>Chief Industrial Adviser to<br>the Government of India<br>and Joint Secretary,<br>Ministry of Commerce &<br>Industry. | *Chairman* |
| Dr. G. P. Kane<br>Industrial Adviser (Chemicals),<br>Development Wing,<br>Ministry of Commerce & Industry. | *Alternate Chairman.* |
| Shri M. P. Alexander,<br>Under Secretary,<br>Ministry of Finance, (RD). | *Member* |
| Shri Jasjit Singh, I. A. S.,<br>Director of Excise & Prohibition,<br>Government of Bombay. | *Member* |
| Shri Shripat, I. A. S.,<br>Director of Industries,<br>U. P. | *Member* |
| Shri S. L. Venkiteswaran,<br>Deputy Development Officer,<br>Development Wing,<br>Ministry of Commerce & Industry. | *Member-Secretary.* |

### Terms of Reference.

4. The terms of reference to the Committee were as follows:

(1) To assess the scope for increasing the production of alcohol in the country having regard to the present and potential availability of raw materials and to suggest suitable locations for any new units for producing alcohol that may need to be set up.

(2) To examine the manner in which the total alcohol production in the country can be fully utilised either as power alcohol or more particularly for industrial purposes and to recommend the industries which can be expanded or established having regard to the increase in the availability of alcohol for industrial purposes in the country.

(3) To study the system of controls exercised by different States over the production, distribution and transport of alcohol and to make suitable recommendations for their simplification, where necessary, in order to ensure that while the objectives of the controls are adequately safeguarded, the industrial concerns which need alcohol as a raw material have the minimum of difficulty in meeting their requirements.

(4) To make any other recommendations that the Committee may deem appropriate having regard to the objectives of increasing the production and utilisation of alcohol for industrial purposes.

Originally, the Gazette Notification stated that the Committee was to submit its report within a period of six months from the date of Notification i. e., by 11the April, 1956. Many handicaps made this difficult. The Member Secretary was required to proceed abroad on a U. N, Fellowship for a period extending up to the end of February, 1956. During this period Government assisted the Committee by appointing Shri V. A. Mehta, Deputy Development Officer (Food) in the Development Wing to act as Member/Secretary until the return of Shri S. L. Venkiteswaran. Shri Shripat fell ill and could not attend the deliberations of the Committee from April to July 1956. The Government of U P. nominated Shri K. L. Bhatia, I. A. S., Joint Secretary, Industries Department to work as a substitute member of the Committee during the absence of Shri Shripat due to illness. Shri M P. Allexender also could not take part in the Committee's work after April 1956 and his place was taken by Shri W. Saldanha, Secretary, Central Board of Revenue The Chairman and the alternate Chairman were busy in connection with the work of several other Expert Committees and teams that arrived in India during this period for preparing special survey reports on various industries. For these reasons it was considered that the time at the disposal of the Committee was inadequate and extension of the date for submitting the report to the 10th of December, 1956 was therefore granted.

## Brief account of the Committee's work.

5. At the outest, the Secretary assisted by Shri S M. Machiraju, late Technical Secretary to the Chief Industrial Adviser, prepared several questionnarires (vide Appendix II) under the advice of the Chairman and Alternate Chairman. These questionnaires were issued to existing and prospective producers and consumers of alcohol, Excise Commissioners and Directors of Industries of the State Governments, and to a number of organisations interested in the subject of manufacture or use of alcohol. Data obtained in replies to these questionnaires as well as that available in the Development Wing were then compiled for consideration by the Committee.

6. The First Meeting of the Committee was held at New Delhi on 2nd March, 1956 when plans for its proramme of work and subsequent meetings were discussed and approved. Subsequent meetings were held in Calcutta on the 9th and 10th May, at Lucknow on 12th May, at Bombay on 11th and 12th June and at Bangalore on the 25th and 26th June, at which the various organisations to whom questionnaires had been issued were given opportunities to present their viewpoints personally before the Committee. To facilitate its deliberations the Committee co-opted the Excise Commissiners and some others officers of the concerned State Governments at these different meetings. The names of persons co-opted in this manner as well as those who appeared before the Committee to present their views are given in Appendix III. A further meeting was held at New Delhi on 6th and 7th

August to which representatives of important State Governments were invited, before the Committee finalised its report at a meeting in New Delhi on 7th and 8th December. Since all members of the Committee were already conversant with the process of manufacture and use of alcohol, it was not considered necessary to organise visits to any of the factories. While the Committee is grateful for the response to its questionnaires, it might be appropriate to mention that some reluctance was noticeable on the part of a number of factories to furnish the desired information and some of the data required were also not readily availabe with the State Governments.

7. One of the principal issues that had to be considered by the Committee relates to taxation and control over alcohol by the State and Union Governments. As this issue was of fundmental importance, the Committee decided to seek the advice of the Ministry of Law on the subject. Their observations were then circulated to State Governments and latter's views ascertained by correspondence as well as at the meeting in New Delhi on 6th August, 1956, before finalising the Committee's recommendations on this important question.

## Report: Method of Presentation

8. Subsequent chapters in this report deal in detail with the present position of the alcohol industry, various handicaps that stand in the way of increased production or utilisation of power and industrial alcohol, scope for future development and targets for the manufacture of alcohol, steps necessary to develop demands for industrial alcohol in the country, steps required for the continued use of alcohol as power alcohol to the extent necessary from time to time and various other issues connected with these problems. Control over the price and distribution of molasses and of alcohol, taxation policy for alcohol, various regulations governing production, possession, distribution, transport and use of alcohol, and other measures essential for achievement of the recommended targets have also been dealt with. A summary of the major recommendations is given in the last chapter.

## CHAPTER II

# BRIEF HISTORY OF THE GROWTH OF ALCOHOL INDUSTRY IN INDIA

### Pre-War Position.

9. In the period before the last war, the use of alcohol was confined almost exclusively to distilled alcoholic beverages, principally plain as well as spiced country spirits with an alcohol content of about 30/40%. Such beverages were manufactured in the country employing either *mahua* flowers or molasses as the principal raw materials. There was also a small demand for denatured or methylated spirit for domestic use, denatured spirit being used in place of methylated spirit because of non availability of wood spirits. The infant pharmaceutical industry also required small quantities of rectified spirits for the production of spirituous medicines and tinctures. Alcohol required for these purposes was usually imported at "Java Spirit" from Java in the denatured as well as undenatured forms. Such imports varied between 300,000 to 400,000 gallons every year right up to 1939. There are few reliable records of the production of alcoholic beverages or of industrial alcohol during this period. Rough estimates made from time to time show that the production of such spirits amounted approximately to 10 million proof gallons each year in undivided India.

### Growth of the Sugar Industry and the Problem of Molasses Disposal.

10. The recent growth in alcohol production in the country is a result of some fortuitous circumstances. During the twenties sugar production in the country was at the low level of about 150,000 tons a year because of severe competition from Java and Mauritius. In 1932 the then Government of India announced a policy of protection to sugar factories. The response to this decision was immediate and very soon a large number of sugar factories came into existence and increased the capacity for sugar production in the country nearly ten times during the course of 4/5 years. A very large proportion of these sugar factories were established in the States of U.P. and Bihar, because of the ready availability of large tracts of land for cane cultivation and of water from irrigation canals. Increased production of sugar created in its wake the problem of disposal of molasses. Since the sugar industry developed in the U. P. and Bihar, there was considerable difficulty in transporting the molasses to port towns, even, if there was scope for exporting it. Indigenous uses of molasses were limited and its accumulation that took place in the absence of demand, constituted a nuisance at and near the sugar factories. During those years it was not considered unusual for sugar factories even to pay a small price per ton to anyone who offered to remove the molasses.

The gravity of the problem of the disposal of molasses was recognised by the first National Governments in the States of U. P. and Bihar and in 1938 they constituted a joint Committee to report on the establishment of an alcohol industry for the specific purpose of disposal of surplus molasses. The Committee considered the various aspects of the establishment of the manufacture of alcohol from molasses and recommended that special efforts should be made for organising the alcohol industry. The Committee recommended also that in order to guarantee an offtake for the product measures should be introduced for making it compulsory to employ alcohol as a motor fuel in admixture with petrol up to 20% as was done in other countries like France. The term "power alcohol" seems to have gained currency from the time this recommendation was made to use alcohol for the production of motive power.

## Growth of the Industry during the War years.

11. The other States besides U. P. and Bihar were also faced with the problem of disposal of molasses by sugar factories as the latter gradually developed in them. The Government of Mysore encouraged the manufacture of alcohol in a distillery attached to the Mysore Sugar Works at Mandya and also enacted legislation in 1939 to enforce admixture of power alcohol with petrol for use as motor fuel The Government of Hyderabad also took up, in 1940, the production of alcohol at Shakarnagar in a Government owned distillery for using the molasses produced in the Nizam Sugar Works, and also took the same steps as Mysore for enforcing the use of alcohol in motor fuel. The first factory to produce similar alcohol in the U. P. went into production during 1941, the admixture of such alcohol with petrol being enforced in the Agra and Bareilly districts. The Government of Bihar was rather slow in following up the recommendations of the Joint Committee referred to above and the first distillery to produce alcohol from molasses commenced operation in Bihar only in 1948. During the period from 1942 to 1946, the Government of U. P. made vigorous efforts to promote the establishment of as many distilleries as possible in its objective of utilising the entire available molasses in the State for conversion into power alcohol. The scarcity of petrol felt during the war years helped these developments to a considerable extent. The direct use of power alcohol in motor vehicles without prior admixture with petrol was encouraged to tide over delays in the provision of mixing facilities at the petrol depots. For some time, even rectified spirit of 96% strength was used in heavy transport vehicles (fuel alcohol) till the new distilleries equipped themselves with dehydration plants to produce 99.5% alcohol.

## Report of the Panel on Sugar, Alcohol & Food Yeast Industries.

14. The power alcohol industry received further support and encouragment as a result of the recommendation of a Panel appointed to report on the Sugar, Alcohol and Food Yeast industries and to submit programmes for their development as part of the post-war development plans for industries by Government of India in 1945. In its report submitted in 1946, the Panel strongly endorsed the necessity of developing a power Alcohol Industry in the country so as to reach a target of production of 20 million gallons by 1950. The Panel also made several recommendations on the utilisation of power alcohol, licensing of distilleries and their location, mixing arrangement for alcohol/petrol blends, control over power alcohol and molasses, transport of alcohol and such other problems. Pursuant to these recommendations the Government of India enacted the Indian Power Alcohol Act, 1948 for the purpose of development of the Industry on an all India basis. Extension of this Act to different States or areas of States from time to time as soon as capacity for the production of alcohol went up has helped to bring about utilisation of available molasses to a considerable extent in the States of U.P. and Bihar. Operation of the Power Alcohol Act without adequate control over the price and distribution of molasses was found to be a difficult proposition from the very beginning. Control on molasses was introduced by the Government of U. P. under the Defence of India Rules as early as 1944. Later on, other State Governments have enacted measures to control the price and distribution of molasses whenever the production of alcohol for alcoholic liquors required such control.

## Difficulties encountered in the expansion of the Power Alcohol Industry.

13. The primary object of all the above enquiries had been the development of the use of alcohol as a motor fuel and to thus provide an avenue for the

utilisation of molasses. Questions relating to the economics of production, the best way of using alcohol as a fuel in internal combustion engines, arrangements for the mixing and marketing of the alcoholic fuel by petroleum companies etc. have been considered in detail from time to time, so that more extensive use of alcoholic fuels could be enforced. While considerable progress has been made in this direction and alcohol petrol blends are in use over practically the entire northern India with the exception of Rajasthan, Madhya Pradesh, and Bengal Government had to face one serious difficulty in getting the Power Alcohol Act extended to more places. This was the price factor. The price of petrol varies in India from place to place depending on transport charges from ports. The U. P., Punjab and parts of Bihar are sufficiently remote from the ports to permit the payment of an economic price for power alcohol to distilleries without necessitating any increase in the price of motor spirit or a drawback in excise duty or other direct or indirect forms of subsidy from the Government. Conditions are different in many other parts of the country where the basic price of petrol is lower due to their nearness to ports.

## Arrangements for the sale of Alcohol Petrol blends

14. Under the arrangements which were worked out with the oil companies, petrol alcohol mixtures have to be sold at the same level as the normal selling prices for pure petrol in each area, and the selling level thus realised on the power alcohol fraction of the mixture is split up into three parts :—

(1) the Excise duty (currently at 15 as. 9 ps. per gallon) same as on pure motor spirit,

(2) a uniform handling charge to the petroleum distribution companies, which have varied from time to time and is at present 0-7-3 per gallon and

(3) **the residual amount** which varies from 15 as. 6 ps. to Rs. 1-10-6 per gallon.

The State Governments handle the sales of power alcohol to petroleum compenies for blending and distribution from depots located in each State. Out of the residual amount (3) realised, the State Governments have to pay a fixed ex-distillery price for the alcohol, and bear the transport charges between the supplying distillery and the mixing depots, the surplus if any being available to meet administrative costs in the first instance and thereafter as an incidental revenue from this scheme. While this arrangement has worked satisfactorily in areas where there is adequate margin between (3) above and the cost of production of alcohol and the transport charges, it has become unworkable in areas where there was no such margin. The residual amount is collected by the Government of each State in which the alcohol is consumed and although some profit margins are realised in some areas, such margins are not available to offset losses in other areas. Some efforts were made to pool such profits and losses in differnt areas but it was noticed that States which derived the profits, *albeit* in fortuitous circumstances, were unwilling to surrender the advantage. Certain alternate arrangements were also concidered but could not be finalised in a manner satisfactory both to the State Government and the petroleum companies.

## Resistance to the use of Power Alcohol.

15. There is another, although not a very substantial point, which deserves mention. This pertains to the opposition from a vociferous section of motorists

to the use of power alcohol-petrol blends as motor fuels. This antipathy probably arises from the experience of motorists during war years, when, for a short time and at some places, neat rectified spirit and not a power alcohol petrol blend was nearly forced on the general public for use as motor fuel. It is clear today that, so long as a motorist is not aware of the fact that he is being supplied with a power alcohol-petrol blend, he has no adverse comments to make on the performance of his engine. It may be stated however that if the use of power alcohol blends is not compulsory in an area, some motorists might still, for psychological reasons, be prepared to pay a slightly higher price for neat petrol, and not *vice versa* as is the position in some European countries. It is well known that the addition of alcohol to pure petrol improves its octane rating in addition to the fuel value possessed by it. Not only is the entire alcohol simultaneously produced with hydrocarbon fractions in synthetic petrol manufacture in Germany, etc., taken advantage of to this end, but in countries such as France and Sweden, alcohol blends are prepared deliberately and supplied to the motorists *at a premium*.

### Shift to industrial uses of alcohol.

16. In recent years considerable developments have taken place in the production of organic chemical products, particulary drugs, dye-stuffs, high polymers, solvents and insecticides. Such industries are generally based, on the cheapest sources of raw materials available, consistent with the size of the unit and comparative economics of plant operations from different possible raw materials. In countries like the United States, natural gas or crude petroleum oils have served as the source of raw materials for these industries and it is not uncommon for factories to produce alcohol from petroleum by-products or natural gas. In a country like India, on the other hand, where resources of natural gas or crude petroleum have not been proved in sufficiently large quantities and we are blessed with a tropical climate conducive to the growth of carbohydrate-rich agricultural crops which could form a perennial source of the required raw materials, the position is the reverse and the availability of cheap alcohol as raw material for organic industries assumes considerable significance. Alcohol can in fact function as one of the most important basic raw materials for many organic chemical industries including pharmaceuticals, a position analogous to that of sulphuric acid in the inorganic chemical industries. The enclosed chart gives some idea of the wide range of products which could be produced from alcohol and its primary importance to the Chemical Industry. Some of the industries based on alcohol are already in existence in the country, though still on a small scale and others are being planned. It is now felt that utilisation of alcohol to establish such industries would be a far more profitable and non-controversial use than the use of alcohol in motor fuels. It must be realised however that establishment of these industries cannot be accomplished overnight and that until the demand for alcohol for such industries increases to the extent necessary, the continued use of alcohol in motor fuels in some part of the country or other may be unavoidable.

17. It is necessary to emphasise that there are likely to be many difficulties which will have to be overcome in order to achieve this change in the pattern of use of alcohol from motor fuel to an industrial raw material. Some of these difficulties would arise from taxation and other policies of different States. It is not uncommon to find that while the cost of a gallon of industrial alcohol is of the order of Rs. 1/—, a fee of Rs. 3/— is being charged on it when used for industrial purposes. Other handicaps like liability to duty on alcohol lost in transit, restrictions on the recovery of alcohol used for processing, high railway freight, impact of the policy of prohibition etc. are dealt

# ETHYL ALCOHOL
$C_2H_5OH$

## Used as a raw material in Chemical Industries.

### Via ETHYLENE $C_2H_4$

**Polyethylene**
a versatile plastic

**Ethylene Dichloride**
used as fumigant and for conversion to vinyl chloride.

**Chlorhydrin & Ethylene Oxide** in the manufacture of ethylene glycol, glycol ethers, ethanol a mines and their derivatives.

**Styrene**
for conversion into polystyrene and for synthetic rubber.

**Cyanhydrine & Acrylonitrile**
possible use in manufacture of methacrylate resins, elestomers and synthetic fibres.

### Via ACETALDEHYDE $CH_3CHO$

**Paraldehyde**
Used as denaturant.

**Ethyl Acetal**
as chemical intermediate.

**Aldehyde Ammonia**
for pharmaceutical.

**Penta Erythritol**
for explosive PETN, sweetening agent, etc.

**Picolines**
used as raw materials in dyes industry and for INH.

**Acetic Acid**
Extensive use in chemical, textile and rubber industries and in vinegar.

**Acetic Anhydride**
Extensive use in chemical industries.

**Crotonaldehyde**
As denaturant and intermediate in manufacture of butanol, butyraldehyde, octanol, butyric acid, etc.

**Butadiene**
important material for GRS synthetic rubber. Also for Haxamethylene diamine required in manufacture of Nylon.

**Cellulose Acetate**
for films & moulding powder.

**Acetate Rayon**
Yarn and textiles.

### DIRECT

**Ether**
used as a solvent and anaesthetic.

**Ethylchloride**
as anaesthetic and manufacture of chemicals, ethyl-cellulose, etc.

**Acetone**
Solvent and in manufacture of diacetone alcohol, hexylene glycol, etc.

**Chloroform**
As solvent and anaesthetic.

**Iodoform**
As pharmaceutical.

**Chloral**
As anaesthetic and for manufacture of D. D. T.

**Ethylacetate**
Solvent, starting material for acetoacetic ester, antipyrin, etc.

**Other Ethyl Esters**
Like Benzoate, Butyrate, Oxalate, etc. varied uses.

**Ethyl Mercaptan**
Used in manufacture of hypnotics, sulfonal, etc.

**Ethyl Amines**
Chemical intermediate.

**Diethyl Aniline**
Aceto phenitidin and other ethylatins (in drugs and dyes industries)

**Ethyl Fulminate**
Used as a detonant.

## Used as a solvent, processing material, vehicle or medium of reaction.

### Used only during process and recovered for re-use (product free from alcohol).

**Reaction Medium**
for many chemical reactions.

**Precipitating Agent.**
for various products like pectin, inulin, sugar, special dextrines, etc.

**Dehydration** of some products like cellulose, sodium hydrosulfite, etc.

**Precipitation & Purification.**
processes like shellac from seed lac, proteins like papain, etc

**Extraction of Glandular Products** from animal sources, alkaloids from plant materials and other drugs or chemicals like glycerophosphate, etc.

**Solvent** for extraction or purification of oils and waxes-vegetable oils, cane wax, lanolin.

**Crystallisation** of numerous organic chemicals of industrial importance and other CP chemicals.

**Miscellaneous Solvent uses** like inks, insect repellants.

### Used in process and product also contains varying proportions of alcohol.

**Pharmaceutical preparations**
both for internal and external uses, e.g. galenicals, tinctures, extracts, also tonic and medicinal wines.

**Manufacture of Toilet requisites** e. g. toilet soaps, liquid soaps, shampoos, body deodorants, rubbing compositions hair and scalp preparations, mouth washes, toilet water.

**Manufacture of Flavours and essences** like flavours for tobacco, extracts and preparations of essential oils and perfume compositions, flavouring materials for food and beverage industries.

**Solvents for Dyes**
for use in food industries, textile printing, etc.

**Solvent for Nitrocellulose & other Synthetic Resins.**
e. g. pyroxylin, collodion adhesives, phenol formaldehyde resins and laminated products, photographic emulsions, surface coatings, etc.

**Solvent for Gums and Resins.**
e. g. shellac varnish, spirit varnishes, polishes.

**Thinner or Diluent**
including use as a component in proprietary solvents, e. g. lacquers, enamels, airplane dopes, etc.

## Used as such

For *heat and light* in homes.

For motive power in motor vehicles.

For various part in *laboratory* being use as *preservative* of speed etc.

For use as antiseptic both general and in hospitals *dispensaries*, etc.

As *antifreeze* in motor vehicles.

As fluid in some instruments and general *cleansing agent* for all instruments and appliances.

*Miscellaneous* including cleaning of cutlery, jewellery, watches etc.

*Alcoholic beverages*

सत्यमेव जयते

with in greater detail further on in this report. It would be necessary to evolve measures for overcoming these difficlties if the country is to achieve an increase in the production and consumption of all types of alcohol from the present figure of 16 million gallons to over 45 million gallons by 1960-61.

**Alcohol used in spirituous medicinal preparations.**

18. The pharmaceutical industry has been employing increasing amounts of alcohol in the form of rectified spirits in recent years, although its requirement is still small in comparison with the over all consumption of alcohol in all forms in the country. The difficulties experienced by the Pharmaceutical Industry in the manufacture of preparations containing alcohol, are of a special nature and at least some of them arise from the diversity of taxation measures in different States and their adherence or therwise to the policy of prohibition. For instance, a constant grievance voiced by most pharmaceutical manufacturers is that while an imported product containing alcohol, once it pays duty at the port of entry, could be freely moved throughout the country without further hindrance, a corresponding product produced by an Indian firm in one State is hampered in its movement into other States by local Excise restrictions. The difficulties experienced by this sector of the industry were considered by an Expert Committee ( Excise ) appointed by the Government of India in 1950. The recommendations made by this Committee in 1951 with regard to uniform rates of duty have been embodied in the Medicinal and Toilet Preparations ( Excise Duties ) Act of 1955. It is expected that when Rules are framed under this Act and they are enforced, some of the major difficulties encountered by manufacturers of pharmaceutical and toilet preparations containing alcohol will be removed. It is unlikely, however, that this industry will contribute significantly to the demand for industrial alcohol. The dificulties that are likely to be experienced in the development of major chemical industries using industrial alcohol have therefore to be tackled separately since the Medicinal and Toilet Preparations Act would not be applicable to such industries.

## CHAPTER III.

## PRESENT POSITION OF THE ALCOHOL INDUSTRY.

### Relation to the Sugar Industry.

19. As mentioned before, the growth of the alcohol industry has been closely connected with the problem of utilising the by-product molasses produced at sugar factories. As the alcohol produced in this manner had to be utilised mostly as power alcohol, it has been essential to keep the cost of production of alcohol as low as possible. For this reason, molasses, the only raw material whose supplies could be harnessed to achieve this end, has been used almost exclusively so far. It has not been difficult for the sugar industry to meet this situation, as the disposal of this by-product presented serious difficulties and, as mentioned earlier, there were times before the development of alcohol industry, when sugar factories had to pay for removal of molasses from their premises. With the present position reached by the industry, the question has sometimes been raised whether sugar factories should not expect to realise a higher price for their molasses than hitherto. In this context, it would be useful to point out that the reduction in the cost of production of sugar by realising even a ten-fold increase in the price of molasses in next to negligible and consumers of sugar would hardly benefit therefrom. On the other hand, the entire future of the alcohol industry built so far with great effort and the diverse industries which may be based on cheap alcohol expected to be made available on a basis similar to the prices ruling for power alcohol, would have to depend on the supplies of molasses being ensured at a uniform price and pegged at the present level ruling in U. P.

**Targets in the First Five-Year Plan and performance.**

20 The production of molasses in India from 1950-51 onwards has been given in Table I.

### TABLE I.

### PRODUCTION OF MOLASSES STATEWISE (IN TONS)

| S. No. | Name of States | 1950-51 | 1951-52 | 1952-53 | 1953-54 | 1954-55 | 1955-56 |
|---|---|---|---|---|---|---|---|
| 1. | West Bengal | 1393 | 2939 | 3566 | 2241 | 3953 | 4360 |
| 2. | Bihar | 77722 | 78897 | 100000 | 47960 | 79573 | 124010 |
| 3. | Uttar Pradesh | 207131 | 242973 | 272000 | 136206 | 353412 | 391580 |
| 4. | Bombay | 37684 | 57643 | 41604 | 40069 | 57536 | 64390 |
| 5 | Madras | 42463 | 52292 | 32127 | 12975 | 26919 | 24820 |
| 6. | Andhra | — | — | — | 14714 | 29064 | 34130 |
| 7. | Punjab (India) | 3609 | 7734 | 5392 | 4429 | 7882 | 11780 |
| 8. | Orissa | 1333 | 1648 | 1778 | 1934 | 1642 | 2750 |
| 9. | Chief Commissioner's States | 1630 | 2579 | — | 1691 | 2076 | 3550 |
| 10. | Pepsu | 4871 | 14072 | 7070 | 4617 | 3888 | 5040 |
| 11. | Madhya Bharat Union | 3509 | 7731 | 2055 | 4581 | 4233 | 11880 |
| 12. | Greater Rajasthan | 894 | 4306 | 246 | 2399 | 5211 | 5570 |
| 13. | Hyderabad | 9484 | 18215 | 17620 | 15571 | 17655 | 30700 |
| 14. | Travancore-Cochin | 2105 | 3738 | 2623 | 1373 | 2342 | 3500 |
| 15. | Mysore | 1369 | 12056 | 9194 | 4169 | 21383 | 18820 |
|  |  | 395197 | 506873 | 496275 | 294929 | 616769 | 736880 |

5,00,000 tons per year was estimated as the possible average production during the first Plan period. Even on a moderate estimate, it should be possible to produce 25 million gallons of alcohol by utilising the above quantity of molasses. In the First Five-Year Plan attention was concentrated mainly on the production of power alcohol and targets of capacity and production were set at 21.2 and 18 million gallons per year respectively. However, the increase in capacity during this period was negligible and any increased production obtained was achieved by better utilisation of the capacity that was already available in 1950-51. The State-wise break up of the capacity for the manufacture of alcohol is given in Table II (opposite) and the production of alcohol, power alcohol as well as other types, from year to year, is indicated in Table III.

## TABLE II.

## STATEWISE BREAK-UP OF ALCOHOL CAPACITY.

| Sl. No. | Name of the State | Total No. of distilleries. | Total installed capacity in 1955 (In Mill. gallons as 100% alcohol). | No. of Units equipped for the manufacture of power alcohol. | Installed Capacity for the manufacture of power alcohol in 1955 (in Mill. gallons). |
|---|---|---|---|---|---|
| 1. | U. P. | 16 | 12.7 | 12 | 10.17 |
| 2. | Bihar | 5 | 2.61 | 2 | 1.29 |
| 3. | Bombay | 5 | 3.09 | 2 | 1.09 |
| 4. | Puujab | 2 | 0.8 | — | — |
| 5. | Pepsu | 1 | 1.0 | 1 | 0.8 |
| 6. | Bengal | 3 | 1.5 | — | — |
| 7. | Madras | 1 | 1.0 | — | — |
| 8. | Andhra | 3 | 1.22 | — | — |
| 9. | Travancore Cochin | 2 | 0.36 | — | — |
| 10. | Mysore | 2 | 1.38 | 1 | 0.54 |
| 11. | Hyderabad | 2 | 1.52 | 1 | 1.02 |
| 12. | Rajasthan | 1 | 0.2 | — | — |
| 13. | Vindhya Pradesh/Bhopal | 2 | 0.4 | — | — |
| 14. | Other capable of producing only low strength spritis in all the States. | 6 | 1.6 | — | — |
| | | 51 | 29.4 | 19 | 14.91 |

## TABLE III.

## PRODUCTION OF POWER & INDUSTRIAL ALCOHOL (IN MILLION BULK GALLONS).

| Year | Power alcohol (dehydrated alcohol) | Rectified spirit | Denatured spirit |
|---|---|---|---|
| 1951 | 5.67 | 5.0 | 1.63 |
| 1952 | 7.72 | 4.6 | 2.10 |
| 1953 | 8.21 | 4.3 | 2.47 |
| 1954 | 8.0 | 4.6 | 2 83 |
| 1955 | 10.4 | 5.15 | 2.98 |

The utilisation of molasses in the production of alcohol during 1955 is shown in Table IV.

## TABLE-IV

### Production and Utilisation of Molasses in relation to Production of Alcohol

| STATE | Production (in million gallons) | | | | | | Molasses Production in 1954-55 (tons) | Molasses estimated to have been utilised for alcohol production (tons) | % of molasses production utilised in the manufacture of alcohol. |
|---|---|---|---|---|---|---|---|---|---|
| | Capacity | Production in 1955. | %Capacity Utilised | Capacity* | Production in 1955 | %Capacity Utilised | | | |
| | Power Alcohol | | | Total Alcohol* | | | | | |
| U. P. | 10.2 | 8.1 | 80% | 12.7 | 10.5 | 82% | 350,000 | 210,000 | 60% |
| Bihar | 1.3 | 0.97 | 77% | 2.6 | 2.0 | 77% | 80,000 | 40,000 | 50% |
| Bombay | 1.1 | 0.25 | 37% | 3.1 | 1.2 | 39% | 57,600 | 24,000 | 42% |
| Punjab/ Pepsu | 0.8 | — | Nil | 1.8 | 0.6 | 33% | 11,700 | 12,000 | Full |
| Southern States. | 1.5 | 1.1 | 75% | 5.5 | 2.8 | †51% | 97,000 | 50,000 | 52% |
| Others. | — | — | — | 3.7* | 1.5 | †40% | 17,000 | 20,000 | Full |
| All India | 14.9 | 10.4 | 70% | 29.4 | 18.6 | 64% | 613,000 | 356,000 | 58% |

*includes low strength spirits.

†includes production from Mahua.

### Analysis of the capacity for manufacture of alcohol.

21. At present, there are in existence 45 distilleries which are equipped for the production of power and/or industrial alcohol viz. alcohol of strength greater than 95% by volume. A list of such factories is given in Appendix IV. Most of the power alcohol factories employ benzene as the entrainer for the final dehydration of alcohol, glycerine being used by one factory and acetates by another. Only 19 factories have the necessary dehydrating equipment and of these only 15 are in regular production for power alcohol. Of the remaining 4, one unit is engaged primarily in the production of industrial alcohol of 98% strength required for the manufacture of acetate yarn. One unit is unable to operate because of the difficulty in obtaining molasses, and another because of its high cost of production due to low capacity. The remaining unit in Mysore, although equipped to produce power alcohol, manufactures only Arrack, and industrial alcohol. Out of these 19 factories, 16 are adjacent to sugar factories, although many of them do not function as integral parts of the sugar units. Out of the remaining 26 factories, 8 produce essentially industrial alcohol, while the rest are interested primarily in the production of potable spirits, industrial alcohol being only an incidental co-product. Out of these 26 factories, only 12 are situated adjacent to sugar factories. There are in addition a few factories producing low strength spirits by continuous distillation, the total capacity of this sector being estimated as 1.6 million gallons expressed as 100% alcohol. There are also five factories which are either remaining idle or have been closed down recently.

### Wide gap between total molasses available and alcohol produced.

22. The figures of capacity and production of alcohol in relation to the availability of molasses (vide Table IV) indicate that there is considerable room for increasing the utilisation of all the available molasses. The gap would appear much larger at the end of the second Five-Year Plan period when 1,000,000 tons of molasses are expected to become available every year, unless special measures are taken to step up the capacity for production of alcohol. It is, therefore, necessary to consider the various difficulties which are reported to stand in the way of such increased production. While the difficulties are only referred to in this chapter, suggestions to eliminate such handicaps are discussed at greater length in later chapters.

### Specific difficulties—Shortage of molasses in certain regions.

23. One of the major difficulties is the non-availability of molasses in some areas, where distilleries are already located. Distilleries in West Bengal and in the Punjab Pepsu haven to been getting adequate supplies of molasses from places nearby and the manufacture of power alcohol or even of low cost industrial alcohol has not been possible due to the high cost of transport of molasses obtained from other States. While considerable initiative was shown by entrepreneurs in establishing distilleries during and since the war, unfortunately sufficient care was not always taken to ensure that the locations were satisfactory from the point of view of obtaining adequate supplies of molasses. A proper integration of distillery capacity with regional availability of molasses will have to be ensured in future planning.

### Difficulties in transport of molasses and inter-State movements.

24. Where the lead from a sugar factory to a distillery is either very long or involves a change of gauge over railways, delays in the transport of molasses

are to some extent unavoidable. It would be necessary to have the wagon requirements carefully worked out for the movement of molasses envisaged in the future development programme of the industry, keeping down the need for transport over break of gauge to the very minimum. Wherever molasses must move from one State to another, inter-State complications often prevent smooth flow of the raw material. The price charged for the molasses has often times been the biggest bone of contention, and instances have not been lacking where States have shown discrimination by imposing additional charges on surplus molasses taken out of their State. It has also been felt that control over the quality of molasses has not been adequate with the result that instances have not been wanting where complaints have arisen of deliberate dilution of molasses by sugar factories.

### Difficulty due to occasional shortage of coal.

25. Short supplies of coal have some times held up production at some factories and it is desirable that the future development programme should provide for the most efficient operation to keep the consumption of coal to the minimum, wherever possible, by utilising the surplus bagasse from the sugar factories.

### Demand for various grades of alcohol.

26. Increased production of alcohol can, however, be achieved only by a corresponding increase in demand in the country. Current consumption of various grades of alcohol in different States is givin in Table V.

## TABLE No. V

**Estimated Statewise consumption of all grades of alcohol (during 1955)—(Expressed in Imp gallons of 100% Vol. Alcohol)**

| State | Reported consumption of alcohol | | | | | Expected additional demand for industrial alcohol on the basis of schemes already under implementation |
|---|---|---|---|---|---|---|
| | Power Alcohol | Rectified spirits | Denatured & specially denatured spirits | Potable spirits other than IMFL | Total | |
| Travancore Cochin. | — | 40,000 | 11,000 | 110,000 | 161,000 | 140,000 for DDT |
| Madras. | — | 250,000 | 221,000 | Nil | 471,000 | — |
| Mysore including Coorg & parts of Hyderabad to be transferred. | — | 97,000 | 125,000 | 144,000 | 366,000 | — |
| Andhra & Telengana | — | 937,000 | 74,000 | 376,000 | 1 387,000 | 800,000 for Sirsilk expansion. |
| Bombay & Saurashtra. | 200,000 | 280,000 | 450,000 | — | 930,000 | 1,500,000 for Polythene, Butanol esters and Ethylene dichloride. |
| Rajasthan & Ajmer. | — | 1,000 | 10,000 | 537,000 | 548,000 | |
| Madhya Bharat, Bhopal, Madhya Pradesh and Vindhya Pardesh. | — | 13,000 | 66,000 | 669,000 | 748,000 | |
| Punjab, PEPSU, Himachal Pradesh and Delhi | 4,000,000 | 30,000 | 240,000 | 350,000 | 4,620.000 | 140,000 for DDT<br>220,000 for E.D. |
| Uttar Pradesh. | 4,200,000 | 126,000 | 330,000 | 540,000 | 5,196,000 | |
| Bihar. | 900,000 | 1,000 | 69,000 | 760,000 | 1,730,000 | |
| Orissa & W. Bengal. | — | 230,000 | 560,000 | 420,000 | 1,210,000 | 2,000,000 for Polythene. |
| Other States | — | 6,000 | 12,000 | 255,000 | 267,000 | |
| Total for All India. | 9,300,000 | 2,011,000 | 2,168,000 | 4,161,000 | 17.64 mill | 4.8 mill<br>or 22.4 mill |

## TABLE VI.

Location of mixing Depots in operation and their demand for Power Alcohol

| Sl. No. | Location | No. of Depots | in gallons | |
|---|---|---|---|---|
| | | | Power alcohol supplied to Depots during 1955-56 | Approximate anual requirements of power alcohol |
| 1. | Agra | 3 | 292,800 | 384,000 |
| 2. | Aligarh | 1 | 107,690 | 120,000 |
| 3. | Allahabad | 3 | 328,500 | 420,000 |
| 4. | Azamgarh | 1 | 33,500 | 36,000 |
| 5. | Bareilly | 3 | 428,600 | 600,000 |
| 6. | Banaras | 3 | 368,700 | 500,000 |
| 7. | Basti | 1 | 58,900 | 60,000 |
| 8. | Dehradun | 2 | 127,700 | 168,000 |
| 9. | Etawah | 2 | 71,300 | 72,000 |
| 10. | Faizabad | 1 | 40,800 | 24,000 |
| 11. | Gorakhpur | 2 | 126,800 | 180,000 |
| 12. | Hathras | 1 | 55,800 | 72,000 |
| 13. | Jhansi | 2 | 213,200 | 254,000 |
| 14. | Kanpur | 3 | 317,300 | 420,000 |
| 15. | Kathgodam | 1 | 144,300 | 180,000 |
| 16. | Kotdwara | 1 | 85,300 | 96,000 |
| 17. | Lucknow | 4 | 411,600 | 540,000 |
| 18. | Mathura | 1 | 38,100 | 36,000 |
| 19. | Mahoba | 1 | 47,200 | 72,000 |
| 20. | Meerut | 2 | 327,000 | 260,000 |
| 21. | Mirzapur | 1 | 48,500 | 60,000 |
| 22. | Muradabad | 1 | 120,300 | 120,000 |
| 23. | Muzaffarnagar | 1 | 44,800 | 48,000 |
| 24. | Saharanpur | 2 | 209,000 | 264,000 |
| 25. | Sitapur | 1 | 71,300 | 84,000 |
| 26. | Satna | 2 | 147,800 | 180,000 |
| 27. | Delhi | 5 | 1,867,300 | 1,980,000 |
| 28. | Ambala | 3 | 536,100 | 696,000 |
| 29. | Ferozpur | 1 | 176,100 | 192,000 |
| 30. | Hoshiarpur | 1 | 78,200 | 480,00 |
| 31. | Jullundur | 3 | 310,000 | 300,000 |
| 32. | Rohtak | 1 | 151,400 | 144,000 |
| 33. | Ludhiana | 1 | 102,900 | 120,000 |
| 34. | Amritsar | 2 | 208,100 | 216,000 |
| 35. | Pathankot | 2 | 227,900 | 240,000 |
| 36. | Kalka | 1 | 151,500 | 120,000 |
| 37. | Patiala | 1 | 112,200 | 96,000 |
| 38. | Kotkapura | 1 | 63,800 | 72,000 |
| 39. | Nasik | 3 | 192,100 | 240,000 |
| 40. | Dhanbad | 3 | 183,000 | 340,000 |
| 41. | Patna | 2 | 165,400 | 300,000 |
| 42. | Bhagalpur | 1 | 86,600 | 100,000 |
| 43. | Katibar | 1 | 60,100 | 100,000 * |
| 44. | Gaya | 2 | 152,500 | 300,000 |
| 45. | Muzaffarpur | 2 | 220,000 | 240,000 |
| 46. | Dinapore | 1 | 60,000 | 120,000 |

*Estimated

The present offtake for power alcohol for use as motor fuel (vide details of mixing depots in operation given in Table VI) is of the order of 10 million gallons per year and it has not been possible to increase this demand due to the financial implications briefly referred to already in Chapter II.

The production of rectified spirit is of the order of five million gallons per year, out of which approximately half is used as denatured spirit. The production and use of rectified spirit for industrial purposes has not increased beyond one million gallons per year in the course of the past five years. In estimating the demands for various grades of industrial alcohol it was noticed that data of detailed break up of the end uses to which alcohol is being put was not available in the different States. Consumption of denatured spirit which has already been estimated at over two million gallons includes its use in the shellac varnish, lacquer, French polish and a few miscellaneous industries. About half a million gallons of rectified spirit may be taken as the present consumption in the pharmaceutical industry for the manufacture of spirituous medicinal preparations, etc. Appreciable quantities of rectified spirit are also used in the manufacture of potable spirits and in the manufacture of foreign liquors like Rum, Gin, Etc. In addition, the direct manufacture of potable spirits may be of the order of 3 million gallons expressed as 100%alcohol and this is not included in production data for rectified spirit.

## Price of Alcohol.

27. It has been mentioned in some quarters that the price paid to distilleries for alcohol was not sufficiently remunerative. At the same time the consumers of industrial alcohol have urged that supplies should be ensured at the lowest possible price, as the price factor would have considerable influence on the demand for alcohol for various purposes. So long as alcohol was consumed mainly in the form of potable liquors, fluctuations or increases in the price of alcohol did not cause significant variation in either the amount consumed or in the ultimate price to the consumers, which included heavy excise duties. For this reason the State Governments and the producers of alcohol have not always been sufficiently alive to the need to keep down the price of alcohol to a low level so as to promote its use for industrial purposes. The importance of a low price is even more significant when alcohol is to be used as a raw material for the production of chemical products, instead of as power alcohol, in competition with other conventional raw materials like petroleum refinery gases or natural gases, here and elsewhere. Not only does it seem to be necessary for the cost of production of alcohol to be kept down at the lowest possible level but adequate steps should also be taken to make such low cost alcohol freely available for use in industrial processes or even for temporary use in motor fuels.

## Difficulties due to excise controls and taxation.

28. A number of other handicaps arising from excise controls are also stated to affect the increased production and consumption of alcohol.

At present, all the control over industrial alcohol is exercised by the State Governments in the context of powers vested in them by the State Excise Acts or State Prohibition Acts. The State Acts and Rules, it has been pointed out, were primarily framed for control over the manufacture of potable spirits but they, willy-nilly, continue to apply also to the manufacture of industrial alcohol and power alcohol. Several of the existing regulations in some States have been found to be irksome and lead to frequent difficulties in continuously operating a modern fermentation and distillation plant for alcohol. Existing excise regulations do not also provide for adequate watch over the efficiency of operation of a distillery and are more concerned with preventing pilferage and misuse of alcohol. Several parties have urged the preparation of a uniform code for control over the factories manufacturing power and industrial alcohol, making due allowance for operation on modern lines. The cost of excise administration is in many States debited to the distillery and this is said to constitute an appreciable portion of the cost of production of industrial alcohol. Producers in States like Bombay complained against the State Government's monopoly in the trade of rectified spirit and specially denatured spirit, leaving only the limited field of ordinary denatured spirit to the private distillers. Power Alcohol distillers have also brought to the notice of the Committee the day to day difficulties due to simultaneous control exercised by officers of both the Union and State Excise administrations over power alcohol. They have indicated certain lacunae in the I. S I. specifications for denatured spirit which cause difficulties when they are enforced by State Governments. Some States, it appears, do not permit denatured spirit of 60 O. P. strength to be marketed freely even though this is the minimum strength laid down in ISI specification and it is likely to be increased further to 66 O. P. at the time of revision of the current specifications.

While manufacturers have brought forward the above difficulties in connection with excise control, the points made by consuming interests have been even more numerous. They suggest uniform regulations to govern the procurement and transport of industrial alcohol under permits and its handling at the consumer's premises, making liberal allowance for bona fide wastages during transit and storage. The levy of excise duties or charges of a similar nature like vend or permit fee etc. on denatured spirit works as a serious handicap particularly when such alcohol is used in chemical processes. Duty free alcohol is a prime necessity in such cases and it has also been urged that levy of local duties or heavy sales tax on industrial alcohol should be discontinued It has been pointed out that rigorous excise control at the consumers premises combined with heavy licence fees or supervision charges tend to discourage development of new industrial uses for alcohol. Use of special denaturants for alcohol required in specific chemical processes, quick clearance of the analysis of samples of denaturants and denatured spirits, facilities for transport of alcohol in bulk in tank wagons instead of in drums etc. have been urged by many industrial consumers. Greater relaxation in the use of rectified spirit under bond permitting its use in the manufacture of more than one product without having to seek separate permission for each product from excise authorities, has been requested by pharmaceutical concerns, who also want that permission should be granted freely for recovery of industrial alcohol wherever it is used only as a processing agent. Supply of duty-free spirit for research and development purposes in private laboratories has been requested. A suggestion has been made that ordinary denatured spirit should be more freely available in States like Bombay and Madras and that procurement and possession of quantities up to one gallon at a time should not require permits. Among other points made out are the removal of lower and higher alcohols from the purview of the definition of "industrial alcohol" or "spirits" and removal of restrictions in the transport of spirituous medicinal preparations between States. Both the producers and consumers have complained against frequent inter-State restrictions on the supplies of industrial alcohol and more facilities for export of rectified spirit have been requested by some interests.

## Other difficulties.

29. Other minor difficulties like lack of adequate transport facilities for the movement of industrial alcohol, and for the transhipment at break of gauge, lack of adequate storage facilities for power alcohol at mixing depots, delays in the payment of prices for power alcohol supplied by distilleries, payment of duty on wastages of power alcohol in transit from distilleries to mixing depots and during storage at mixing depots prior to actual mixing with petrol, etc. have also been pointed out by the manufacturers of power alcohol.

The handicap of a high freight rate on rectified spirit has been pointed out repeatedly and it has been suggested that not only the railway freight on rectified spirit and denatured spirit should be of the same order, but that the freight should be at as low a rate as possible consistent with the use of alcohol as an industrial raw material.

## CHAPTER IV.

## PROSPECTS FOR DEVELOPMENT OF THE ALCOHOL INDUSTRY AND THE SETTING UP OF ADDITIONAL CAPACITY

30. The prospects for the development of the Alcohol Industry have to be examined from two major points of view viz., the demand which can be built up and the quantity of raw material available for its manufacture.

### Possible demand for alcohol.

31. The demand for Alcohol falls into three well defined categories, viz.,

(1) Alcoholic liquors for human consumption—this includes alcoholic liquors produced directly by distillation of a low strength product and those produced by processing of pure rectified spirit,

(2) The demand for alcohol for various industrial purposes—this includes its use as a raw material in the various industries as well as in spirituous medicinal and toilet preparations, and as ordinary denatured spirit for domestic purposes.

(3) Power alcohol for use in motor fuel blends.

### Demand as alcoholic liquors for human consumption

32. The Committee is not concerned with the first item except to the extent of the demand for rectified spirit for use in the manufacture of such alcoholic liquors and the influence diverse issues relevant to the policy of prohibition might have on the power and industrial alcohol industry. There are no reliable estimates of the quantity of rectified spirit used in the manufacture of alcoholic liquors for human consumption. The production of various Indian Made Foreign Liquors like Rum, Gin, etc. is estimated at 500,000 gallons per year and most of this production is derived by the further processing of rectified spirit initially produced. A certain amount of rectified spirit is also converted into alcoholic liquors other than Indian Made Foreign Liquors, viz,, country spirit. But the quantity converted in this manner varies from year to year and from State to State As a rough approximation, the total quantity of rectified spirit used for the various alcoholic liquors for human consumption may be estimated at 1.5 millon gallons per year. Additional quantities of alcoholic liquors for human consumption are also produced by direct distillation of low strength products without the products being classifiable as industrial alcohol. The scope of the present enquiry does not include the manufacture of such alcohol; nevertheless as the raw material used for the manufacture of both high strength and low strength alcohol is the same, necessary provision will have to be made for the supply of the required quantity of raw material for the manufacture of all types of alcoholic liquors. It is estimated that the total consumption of all such alcoholic liquors may be taken at four million gallons for purposes of raw material assessment. Out of this 1.5 million gallons as estimated previously are produced first as rectified spirit and subsequently converted. It may be taken that this demand may not increase during the coming years on account of the policy of prohibition. It is also likely that when the demand goes down with the extension of prohibition in more States, the loss of this demand may not have any serious impact on the industrial alcohol industry since the quantity involved is likely to be small in comparison to other demands which are expected to be developed. Some of the small units which

are now engaged in the exclusive production of such low strength spirits, or those which depend upon such production to a very large extent, may have to be closed down.

## Scope for use of Industrial alcohol.

33. In regard to the demand for industrial alcohol for various uses the present consumption is estimated at 4 to 4.5 million gallons per year. Some of the major industries which could be based on alcohol have been referred to at the beginning of the report. It may, however, be useful to summarise the various products which could be obtained from alcohol and the other major uses of industrial alcohol and the estimated demand for each such use on the basis of reasonable targets to be achieved by 1960-61. This is given in Appendix V.

## Use in some major industrial projects.

34. Some of the products listed or targets proposed for the use of alcohol in some of the above industries are already under implementation. As examples may be mentioned the manufacture of polyethylene based on alcohol by two firms, one at Calcutta and other at Bombay, the manufacture of ethylene dichloride by two firms one at Delhi and other at Bombay, the manufacture of acetic acid and various solvents by one firm in Bombay and the units for the production of chloral in the Government owned D. D T. factories, one operating at Delhi and the second under establishment at Alwaye. There are also a few other projects which are under active consideration and may be taken up in the near future, viz , the manufacture of synthetic rubber requiring 10/12 million gallons alcohol and various organic intermediates for the manufacture of dyes and pharmaceuticals requiring 0.8 million gallons per year. There is also scope for further development of industries based on alcohol to the extent indicated. The scheme for the manufactre of various organic intermediates of dyestuffs and other industries would require not only 800,000 gallons of alcohol indicated above but also a number of chemicals to be produced from alcohol, viz.,

| | | |
|---|---|---|
| Acetic anhydride | — | 210 tons |
| Acetone | — | 400 ,, |
| Butylacetate | — | 650 ,, |
| Diethyl Acetal | — | 350 ,, |
| Diethyl Amine | — | 150 ,, |
| Acetic Acid | — | 2000 ,, |
| Butyl alcohol | — | 250 ,, |
| Ethyl Acetate | — | 980 ,, |
| Ethylene Oxide | — | 430 ,, |

It may be expected that all these chemicals will be produced from alcohol in due course at suitable locations, in view of the availability of low cost alcohol ~~that~~ can serve as a raw material for such manufacture. There is also considerable scope for increasing the production of acetate rayon by establishment of more factories, as it is likely to provide a ready outlet for cotton linters and alcohol, both of which could be eventually obtained in adequate quantities from indigenous sources The manufacture of chloroform and ether for general uses as solvents has still to be developed in the country and it may be possible to establish the manufacture of cellulose acetate for use as raw film and as moulding powder in a project which is under consideration. On the basis of demands for alcohol listed in appendix V against various industries, certain specific proposals for the establishment of new alcohol based industrial units in the country are also indicated in Table **VII.**

## Use in miscellaneous industries.

35. The use of industrial alcohol in industries like shellac varnishes and lacquers may also increase during the next few years, but the additional demand which is created may not be appreciable. The alcohol used in the manufacture of spirituous medicinal preparations, toilet requisites and perfumery has been estimated at about 500,000 gallons per year. No large increase in this demand is anticipated. It may, however, be possible to increase the consumption of ordinary denatured spirit for domestic and other miscellaneous purposes provided it is made available at a low cost and without serious restrictions on its possession and use.

## Possible demand for use as motor fuel.

36. In regard to the demand for alcohol for use in motor spirit, at first sight it would appear that the scope for extending it would be very large. Consumption of petrol today is of the order of 300 million gallons per year and on the basis of a 20% blend being enforced all over India, the consumption as power alcohol could increase to 60 million gallons. But, there are several practical issues, principally the one relating to financial losses that may be entailed in the adoption of such a measure, which prevent this demand from materialising, except under conditions of extreme emergency, It is also generally considered that the use of alcohol in motor fuels is the least profitable way of utilising it, particularly in a country like India, although it may be justified at times from a strategic point of view. Taking into consideration the recent establishment of petroleum refineries in India and the investigations in hand for exploring the availability of crude oil in the country and the setting up of additional refineries based on it, it is felt that there may be no need to promote the manufacture of alcohol, primarily for use as a motor fuel, although at certain times and in certain areas some proportion of the overall production may have to be inevitably used in this manner. The future alcohol industry would have therefore to be planned on the basis of meeting the possible demands indicated in the previous paragraphs and of producing the alcohol as far as possible from low cost raw materials only. The use of alcohol as a motor fuel may be kept in mind to provide a flexible demand to cover any imbalance between anticipated production based upon available raw materials and the gradual development of demand for various industrial purposes. In other words, use of power alcohol may be kept as a stop gap demand to be withdrawn as the demand for industrial uses goes up. Details of arrangements to be provided in this connection are discussed in a later chapter.

## TABLE VII

## Specific proposals for development of Major Alcohol-Based Industries.

### 1. Ether.

Three plants are already in operation and they may be assisted to improve their operation and reduce the cost of production Alcohol may be supplied at a low rate and free of duty. New units, if considered necessary.

### 2. Ethyl Chloride

A new unit may be considered if it is linked up with proposals or manufacture of chemicals like ethyl cellulose, T. E L., ethyl amines, etc. Existing unit which mainly manufactures B. P. Grade may be assisted in the supply of alcohol.

### 3. Acetone

Existing units may be assisted in the supply of low cost alcohol. A new unit based on isopropyl alcohol may be established in or near a port town. The manufacture of acetone from alcohol should not normally be encouraged as it may be relatively less economical even under the conditions obtaining in India. It should be cheaper to produce acetone from imported isopropyl alcohol. Such a new unit may be encouraged if it is linked up with the manufacture of solvents based upon acetone like diacetone alcohol, isophorone, etc.

### 4. D. D. T.

Assistance in the supplies of alcohol to be provided.

### 5. Pharmaceutical products and organic intermediates.

The new units likely to be set up in the light of the recommendations of the Russian experts may be assisted in the supply of the required quantities of alcohol. The location of the unit has not yet been determined.

### 6. Ethylene Dichloride

Two units have already been licensed and they may be assisted in the supply of low cost, duty free alcohol. A third unit may be allowed if it is linked up with the scheme for manufacture of other products like vinyl chloride, etc.

### 7. Ethylene oxide Glycol & derivatives.

One unit in Delhi in association with the ethylene dichloride plant may be feasible with a capacity of 900 tons of ethylene oxide, using 300,000 gallons of alcohol. As an alternative a site near Bengal may also deserve consideration. Some quantity is also expected to be made by the National Carbon plant in Bombay.

### 8. Acetal-dehyde Based chemicals (Excluding the requirements of acetate rayon and cellulose acetate).

(a) 1200 tons : Acetaldehyde for direct condensation products like acetal, paradehyde, aldehyde ammonia, picolines, pentaerythritol, etc.

(b) 6,000 tons : Acetic acid for direct use in chemical, textile and other industries.

(c) 1,000 tons : Acetic anhydride.

(d) 3,000 tons : Esters (mainly ethyl and butyl)

(e) 1,400 tons : Crotonaldehyde for conversion to 750 tons Butanol and 300 tons of butyraldehyde and octanol, etc. and the rest for direct use.

The new project under development in Bombay is expected to make some of these items to a small extent; nevertheless there seems to be scope for additional capacity to be established. One in U. P. and another in Madras, each using about two million gallons of alcohol per year. After conversion of alcohol to acetaldehyde in each of them in units of 20 to 25 tons a day capacity. One of the units may take up the crotonaldehyde series and esters, while the other unit may concentrate on acetic anhydride and other products. Both of them may manufacture acetic acid to equal extent.

### 9. Acetate rayon/cellulose acetate.

One unit is in operation in Hyderabad and may expand production to 3,000 tons per year.

One new unit for cellulose acetate at Mandya with capacity of 3,000 tons.

One or more new units for acetate rayon, preferably in Bombay and Andhra with capacity of 3,000 tons each.

### 10. Synthetic Rubber.

This should be a priority scheme both from the point of view of alcohol utilisation as well as essentiality of the product. Manufacture of Butadiene, one of the components required, may be established in U. P. Over 11 million gallons of alcohol are required for 15,000 tons of butadiene which is necessary for an output of 20,000 tons of synthetic rubber (GRS).

### Raw materials generally used in the manufacture of alcohol.

37. Materials rich in sugars or other more complex carbohydrates such as molasses, potatoes, corn, tapioca, etc., are commonly employed in the manufacture of alcohol. Even cellulosic materials could be utilised in this manner when conditions are very favourable. Waste liquor from the digestion of coniferous woods to obtain pulp and paper by the sulphite process also contains small quntities of sugars and has therefore been successfully used for manufacture of alcohol. Natural gas, petroleum refinery gases, or other sources of ethylene are used to a large extent in the production of alcohol by the synthetic process.

### Availability of the requisite raw materials in India.

38. On the question of alternate raw materials for the manufacture of alcohol and their availability in India, it may be stated that it does not seem necessary at present to envisage the manufacture of power or industrial alcohol from any raw material other than molasses. As the cost of production of alcohol would have to be maintained at the lowest possible levels to stimulate new demands, the other possible raw materials do not provide this facility. Moreover, even the alcohol that could be produced from molasses expected to be available during the next few years, is likely to be much greater than the likely demands for industrial purposes and would leave a considerable surplus to be absorbed as power alcohol The only other materials which could be considered are mahua flowers; these are in use to a small extent as a source of alcohol. The use of this material could continue at certain locations where it is available at a low cost and where the alcohol is intended for use mostly as potable spirits In the event of any large capacity pulping plants being established in the country in the near future employing the sulphite process, the manufacture of alcohol as a bye-product from the waste liquors after digestion would require serious consideration.

### Requirement of molasses for other uses.

39. It has been suggested that molasses may be used for other industrial purposes like the manufacture of Food, Yeast, Citric Acid, Butyl Alcohol, etc. While scope for these developments should also be fully explored, it is considered that for a long time to come only small quantities of molasses may be utilised for these purposes. In regard to the suggestion that molasses may be used as a fertilizer or after suitable blending as a cattle food, it is doubtful if any of these demands would provide adequate economic outlets. In so far as its use as a fertiliser is concerned, it might be equally feasible to use the waste liquors from distilleries after fermentation and distillation of alcohol for this purpose without any serious reduction in fertiliser value vis-a-vis fresh mollasses. The scope for its extensive use as cattle feed would have still to be investigated.

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## TABLE VIII

## AVAILABILITY OF MOLASSES IN DIFFERENT REGIONS & POSSIBLE ALCOHOL OUTPUT

Sugar & Molasses in tons — Alcohol in Imperial Gallons of 100% volume.

| Sl. No. | STATE | Cane Capacity/day available at present | Cane* Capacity/day. Expected on the basis of licences already issued or accepted for licensing upto 30-10-56 | Expected season days | Expected molasses Cane. | Expected molasses output on the basis of (4) & (5) | Molasses estimated to be available from 1959 onwards for alcohol manufacture | Possible alcohol production corresponding to col (7) (thousands) | Other raw materials available or in use (Mahua) (Tons) | Possible additional output corresponding to col (9) (thousands) | Possible total alcohol production (8) & (10) (thousands) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5(a) | 5(b) | 6 | 7 | 8 | 9 | 10 | 11 |
| 1. | Travancore-Cochin | 500 | 500 | 150 | 4.0 | 3,000 | 3,000 | 150 | — | — | 150 |
| 2. | Madras | 3640 | 10500 | 150 | 4.0 | 63,000 | 55,000 | 2750 | — | — | 2750 |
| 3. | Mysore including Coorg & parts of Hyderabad and Bombay to be transferred | 2000 | 9400 | 165 | 4.0 | 62,000 | 50,000 | 2500 | — | — | 2500 |
| 4. | Hyderabad (Telengana only) | 3420 | 4500 | 135 | 4.0 | 24,300 | 24,000 | 1200 | 4,000 | 250 | 1450 |
| 5. | Andhra | 5225 | 16500 | 120 | 4.0 | 79,300 | 60.000 | 3000 | — | — | 3000 |
| 6. | Bombay & Saurashtra. excl. Karnatak area but incl. Marathwada). | 10625 | 28400 | 130 | 4.0 | 1,46,000 | 125,000 | 6250 | 1,500 | 90 | 6340 |
| 7. | Rajasthan and Ajmer | 1550 | 1600 | 120 | 4.0 | 77,00 | 6,000 | 300 | — | — | 300 |
| 8. | Madhya Bharat & Bhopal | 3550 | 3900 | 120 | 3.8 | 18,000 | 15,000 | 750 | 8,000 | 480 | 1230 |
| 9. | Uttar Pradesh | 71374 | 92300 | 125 | 3.7 | 4,22,000 | 400,000 | 20,000 | — | — | 20,000 |
| 10. | Punjab/PEPSU | 1950 | 10700 | 135 | 3.5 | 50,300 | 45,000 | 2250 | Grains | 50 | 2300 |
| 11. | Bihar | 28536 | 31100 | 105 | 3.6 | 1,17,000 | 106,000 | 5300 | 2,000 | 130 | 5430 |
| 12. | Orissa | 250 | 1900 | 120 | 4.0 | 9,000 | 8,000 | 400 | — | — | 400 |
| 13. | W. Bengal | 1550 | 2900 | 120 | 4.0 | 13,900 | 12,500 | 625 | — | — | 625 |
| 14. | Other States | Nil | 1800 | 120 | 4.0 | [illegible],600 | 7,000 | 350 | — | — | 350 |
| | Total in India | 134150 | 217700 | — | — | 1,024,100 | 911,500 | 45875 | 15,500 | 1000 | 46875 |

*rounded to nearest hundred tons.

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## Expected production of sugar.

40. The target for the production of sugar has been placed at 2.25 million tons. This corresponds to a possible production of 870,000 tons of molasses. In some quarters, the above target for sugar has, however, been considered to be rather low and a higher target has been suggested, taking into consideration the increasing shift in demand from gur to sugar and the increase in population and purchasing power. The Planning Commission seems to have preferred a higher target of capacity of 2.75 million tons per year. In discussions with the representatives of State Governments, it was pointed out also that production of sugar was likely to be higher than that estimated previously by the different States on the basis of existing capacity for the crushing of sugarcane. It is understood that several State Governments have active programmes for improvement of yield per acre and this with other facilities is likely to result in a longer average season at most of the sugar factories leading to a production greater than 2.25 million tons of sugar.

## Estimate of molasses output and possible alcohol production.

41. The Committee has therefore assessed the possibility of molasses production in different States on the basis of such information as was available in regard to the availability of sugar-cane in different areas and the crushing capacity licensed (vide Appendix VI) in each area. The estimates would, however, require revision from time to time in the light of the actual progress of licences for the manufacture of sugar already granted and additional licences for this industry which might be issued in the near future. As per details in Table VIII, the production of molasses is expected to be of the order of 1020,000 tons per year from 1959-60 onwards and of this 911,000 tons may be taken to be the quantity that will be readily available for the manufacture of alcohol. Even on a modest estimate the molasses thus available should yield over 45.8 million gallons of alcohol expressed as 100% volume. In addition to this, production of another one million gallons per year may also be expected to continue as at present from mahua flowers as raw material. The installed capacity necessary to ensure an alcohol production of 46 to 47 million gallons may have to be at least 10% more i. e. it will have to be of the order of 51/52 million gallons per year.

## 42. Location of additional capacity of alcohol.

As it is essential to ensure that the total distillery capacity i. e. present installed capacity and those under implementation as well as any additional capacity which should be licensed hereafter, is distributed equitably to match the regional availability of molasses, a careful analysis has been made of the overall position and the possible location of new distilleries as well as expansions of existing units. These have been indicated in Table IX. It is pointed out however that the question of additional licences for alcohol and the scope for setting up industries based on it would have to be reviewed from time to time depending on the progress made in each State for bringing additional land under cane cultivation and the setting up of new sugar factories. This aspect has been particularly emphasised by the representative of Orissa Government and the Committee accept the same as valid and deserving of full consideration.

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## TABLE—IX.

## PRODUCTION CAPACITY FOR ALCOHOL ALREADY AVAILABLE OR LICENSED & LOCATION OF ADDITIONAL CAPACITY.

| Sr. No. | STATE | Molasses available (tons) from 1959 onwards | | Possible alcohol production from 1959 (gallons) including production from mahua | Present distillery capacity (including weak Spirit) | Actual production (1955) | Licences granted for new capacity or expansions by 1958. | | Total capacity expected by end of 1958. | Licences which may be granted for production from 1958. | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimated production. | Available for alcohol manufacturer (including supplies from neighbouring States, where possible). | | | | Place (E—Expansion) (N—New Unit | Capacity licenced. | | Place | Capacity new or Expansion. | |
| 1 | 2 | 3(a) | 3(b) | 4 | 5 | 6 | 7(a) | 7(b) | 8 | 9(a) | 9(b) | 10 |
| 1. | Travancore-Cochin | 3,000 | 3,000+3,000 from Madras area. | 300,000 | 360,000 | 150,000 | — | — | 360,000 | | — | Supply of molassas from Madras upto 3,000 and hence production to increase to 300,000 gallons. |
| 2. | Madras | 63,000 | 52,000 | 2,600,000 | 1,000,000 | 600,000 | Nil | Nil | 1,000,000 | Pugalur—N<br>or<br>Pettavatalai<br>Tanjore—N<br>Udumalpet-N | 600,000<br><br>800,000<br>300,000 | |
| 3. | Mysore (including Karnatak areas of Bombay & Hyderbad) | 62,000 | 50,000 | 2,500,000 | 1,500,000 | 627,000 | Mandya—E | Completed & included in Cols 5 & 6 | 1,500,000 | Hospet—E<br>Mandya—E<br>Belgaum Dt.—N | 600,000<br>300,000<br>400,000 | |
| 4. | Andhra & Telengana | 103,600 | 84,000 | 4,450,000 | 2,950,000 | 1,480,000 | Thumapala-E<br>Bobbili—N | 480,000<br>300,000 | 3,730,000 | Vuyyuru—E<br>Samalkot—E<br>Repalle—N<br>Krishna Dt.—N or Guntur Dt. | 300,000<br>300,000<br>500,000<br>500,000 | Location in Krishna or Guntur district to depend on sugar licence's progress. |
| 5. | Bombay & Saurashtra (excluding Karnatak area but including Marathwada) | 146,000 | 125,000 | 6,340,000 | 3,090,000 | 1,210,000 | — | — | 3,090,000 | Belapur—E<br>Kolhapur—N<br>SholapurDt.—N<br>Poona Dt —N<br>Surat Dt.—N<br>Nasik road to be shifted less<br>Rawalgaon or Malegaon—N | 2,500,000<br>900,000<br>800,000<br>400,000<br>400,000<br>1,000,000<br>500,000 | Contemplates shifting of Nasik Plant to Belapur area and working to full capacity of other existing units. Actual location in districts indicated will depend on the progress in sugar licences. |
| 6. | Rajasthan & Ajmer | 7,700 | 6,000 | 300,000 | 200,000 | 100,000 | — | — | 200,000 | — | — | |
| 7. | Madhya Pradesh M.B. Bhopal & V.P. | 18,000 | 15,000 | 1,230,000 | 1,400,000 | 323,000 | Ratlam—N | 500,000 | 1,900,000 | Eypansion-Ratlam | 400,000 | |

| 1 | 2 | 3(a) | 3(b) | 4 | 5 | 6 | 7(a) | 7(b) | 8 | 9(a) | 9(b) | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8. | Punjab, PEPSU, Delhi & Himachal Pradesh | 50,000 | 45,000 | 2,300,000 | 1,800,000 | 560,000 | — | — | 1,800,000 | Khasa<br>Karnal | 500,000<br>300,000 | Location not happy and may be shifted to Jagadhri and Panipat. |
| 9. | Uttar Pradesh | 422,000 | 400,000 | 20,000,000 | 12,700,000 | 10 700,000 | Meerut—E<br>Mansurpur-N<br>Shamli E & S<br>Rajaka – E<br>Sahaspur Nawabgunj —E<br>Seohara—N<br>Rampur – E<br>Daurala—E | 660,000<br>720,000<br>340,000<br>510,000<br>660,000<br>1,320,000<br>510,000<br>700,000 | 17,740,000 | Mansurpur—E<br>Shamli—N<br>Hargaon & Gola —E<br>Location to be determined at a later date—E. | 300,000<br>900,000<br>900,000<br>2,250,000 | As alternative to expansion at Hargaon & Gola, a new unit may be licensed at Pilibhit.<br>† |
| 10. | Bihar | 117,000 | 96,000 | 4,930,000 | 2,750,000 | 1,900,000 | Narkatiagunj —N | 960,000 | 3,700,000 | Darbhanga Dt. —N<br>location to be determained at a later date—E | 1,000,000<br>500,000 | About 10,000 tons molasses to go to Bengal to enable better utilisation of capacity in that area. Hence production in Bihar will be only 4.9 million gallons. |
| 11. | Orissa | 9,000 | 8,000 | 400,000 | 200,000 | 100,000 | — | — | 200,000 | Location to be determined at a later date | 500,000 | With molasses from Behar area production in West Bengal will be increased to 1,125,000. |
| 12. | Bengal | 13,000 | 12,500 | 1,125,000 | 1,500,000 | 450,000 | — | — | 1,500,000 | — | — | |
| 13. | Assam & other areas. | 8,600 | 7,000 | 350,000 | — | Nil (only liquor) | — | — | — | Dimapur—N | 400,000 | |
| | TOTAL | 1,024,100 | 911,500 | 46.8 Mill. | 29.4 Mill. | 18 2 Mill. | — | 7,300,000 | 36.7 Mill. | | 17.06 Mill | Capacity total : 53.7 million |

## TABLE—X.

## OVER ALL POSITION EXPECTED IN THE PRODUCTION AND UTILISATION OF ALCOHOL

Gallons of 100% Volume.

| Sl. No. | STATE. | Additional licensing required for alcohol production. | Possible output by 1959 within the State. | Anticipated demand including schemes already under implementation. | New projects to be taken up and alcohol likely to be utilised in them. | Surplus P. A. in the area available for use as motor spirit. |
|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1. | Travacore-Cochin | Nil | 3,00,000 (Using 3000 tons molasses from other States). | 300,000 | — | |
| 2. | Madras. | 1,700,000 | 2,600,000 | 4,71,000 | Acetic Acid etc. 1,500,000 | Interim use about 1 mill. |
| 3. | Mysore. | 1,300,000 | 2,500,000 | 370,000 | Cell. acetate—1,200,000<br>Pharma ceutical—200,000 | Interim use about 700,000 |
| 4. | Andhra and Telengana. | 1,600,000 | 4,450,000 | 2,200,000 | Export—500,000<br>Chemicals for acetate rayon 1,000,000. | Interim use about 1,500,000 |
| 5. | Bombay. | 4,500,000 | 6,340,000 | 2,200,000 plus 200,000 as P. A. | Acetate rayon 1,500,000<br>Chemicals—500,000 | 2,000,000 |
| 6. | Rajasthan. | — | 300,000 | 550,000 } | — | |
| 7. | Madhya Pradesh. | 400,000 | 1,230,000 | 750,000 } | | |
| 8. | Punjab/PEPSU/Delhi. | 800,000 | 2,300,000 | 1,000,000 plus 4,000,000 as (P.A.) | Ethylene—500,000 derivatives. | 7 million gallon in the whole area. |
| 9. | U. P. | 4,350,000 | 20,000,000 | 1,000,000 plus 4,200,000 (P.A.) | Butadiene—12,000,000<br>Acetic acid and chemicals—2,000,000 | |
| 10. | Bihar | 1,500,000 | 4,930,000 | 1,000,000 plus 900,000 as (P.A.) | Organic (*) Intermediates 800,000 | |
| 11. | Orissa. | 500,000 | 400,000 | 200,000 | — | |
| 12. | Bengal | Nil | 1,125,000 (Using 10,000 tons molasses from Behar) | 3,000,000 | Alcohol to the extent of 2 million gallons to be secured from U. P. and Behar | — |
| 13. | Assam and other Areas. | 400,000 | 350,000 | 300,000 | — | — |
| | TOTAL | 17.1 mill. | 46.8 mill. | 13.2 mill.<br>9.3 mill as P.A. | 21.7 mill. | 12.2 mill. |

*Location not finalised

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## Economic capacity for a distillery.

43. In this context the question of the minimum size of a distillery for yielding low cost alcohol under normal conditions in India at present has been considered and it works out to a million gallons per year. Units of this capacity have been recommended to be established wherever adequate quantities of molasses can be economically pooled at suitable central locations. It has been felt that in certain cases where such pooling of at least 20,000 tons of molasses is not feasible, distilleries of smaller capacities may be located as adjuncts to sugar factories on the basis of operating the distillery only during the sugar season and drawing on the resources of the neighbouring sugar factory for power, steam, etc. Under such specified conditions the economics of production in such units may not also be too disadvantageous vis-a-vis production in units of one million gallons capacities.

It is also suggested that in the context of capital goods of considerable value in the form of plant and machinery for new distilleries required, efforts should be made to fabricate the equipment locally as much as possible. Opportunity should be taken to establish capacity for fabrication of distillery plants in the country, and adopt 'know how' and designs of improved distillation equipment developed in recent years in some of the foreign countries. As it is expected that the full increase in the capacity for sugar production will be achieved by the end of 1959, additional capacity for the production of alcohol from the molasses which will become available by then should also be ready by 1959-60.

44 In the light of the diverse aspects discussed above, the overall position with reference to anticipated production of alcohol and its utilisation for different purposes is given in Table X. The pattern of such anticipated consumption of 46.8 million gallons may be some what as follows :—

> 30 to 32 million gallons for diverse industrial uses; 4 million gallons in the form of alcoholic liquors and the balance of nearly 11 to 12 million gallons in blend with petrol as motor fuel-as against the present consumption of 4 to 4.5 million gallons for industrial purposes, 4 millions gallons as potable spirits and 9 to 9 5 million gallons as power alcohol.

45. The success of any scheme for effective utilisation of molasses for the production of alcohol would have to depend on close co-operation between different interests. The expansion in capacity envisaged will involve an investment of the order of Rs. 20 million on plant and machinery It will be difficult to persuade the private sector to undertake such an investment unless there is a continuous and guaranteed offtake for the product. This involves a careful co ordination of the various schemes for manufacture of chemicals and chemical products from alcohol and for arrangements for at least a temporary use of alcohol as motor fuel in certain areas, so as to ensure that capacity for alcohol will not have to remain idle. It is also essential to mitigate some of the handicaps faced by the alcohol industry at present, which have already been discussed at length in the previous chapter. It might be unavoidable to exercise control over the price and distribution of molasses so that this raw material is made available without unnecessary difficulties at the most reasonable price. Simultaneously, it is essential to enforce a reasonable measure of control over the price of alcohol so that neither the producer nor the consuming industries would suffer. It would also be of the greatest importance to ensure

that the taxation policy for industrial alcohol is framed in such a manner that the ultimate cost of alcohol to several categories of industrial consumers is kept sufficintly low. Some of the difficulties currently experienced in the distribution and transport of industrial alcohol and in the control exercised over its consumption at the industrial users' premises require also to be removed as much as possible. These aspects are discussed in subsequent chapters.

## CHAPTER V

## THE PRICE OF ALCOHOL

46. It has been explained already that the success of any contemplated programme for increased production and utilisation of alcohol depends on its price. The problem of a fair price for alcohol is rather complicated because it requires examination against the background of several factors resulting from the diverse uses to which alcohol could be put and the necessity to find such uses in the context of an extension of the policy of prohibition within the country. Wherever alcohol is used as a fuel, its price must be fixed at a level corresponding to the price of petrol. When it is to be used as a raw material for industries for the production of chemical products such as synthetic rubber, solvents, etc., included in categories 1 and 2 of Appendix V, alcohol should be available at the lowest possible price. Industries listed in category 3 of Appendix V and including the manufacture of lacquers, varnishes, medicinal preparations for external application, etc., could afford to pay a somewhat higher price for alcohol. A still higher price is permissible for alcohol used in the production of toilet requisites, perfumery, essences and spirituous medicinal preparations, because these products themselves are sold at comparatively high prices. The alcoholic liquors industry can be asked to pay the highest prices for alcohol, partly because it is the desire of Government to keep down the consumption of such liquors and also because the tax levied on potable liquors is a source of revenue to the States. This wide disparity in the extent to which different consumers can afford to pay for alcohol required by them makes it very difficult to arrive at a basic uniform price for alcohol unless this question is tackled from the point of view of a fair and reasonable return to the producer of alcohol together with graded taxation depending upon the purpose for which alcohol is to be used.

### Extent of control over price of alcohol in operation at present.

47. At present, control of price is exercised only with respect to alcohol used in admixture with petrol as a fuel for motor vehicles. The rate has been fixed at Rs. 0-14-0 per gallon ex-distillery under the Indian Power Alcohol Act wherever this Act is applicable and also under the Bihar Power Alcohol Act in the State of Bihar. In the U. P. the price of rectified and denatured spirits was controlled until April 1956, at Rs. 1-8-0 and Rs. 1-12-0 per gallon respectively. The only other control exercised over the price of alcohol used for other purposes has been an indirect measure resulting from a Government monopoly over the sales of rectified spirit that is in operation in the State of Bombay. In the case of alcohol supplied as a raw material to industries, not only has there been no effort made to keep down the price of alcohol anywhere in the country, but levies such as vend fees, permit fees and higher freight rates have led to the prevalence of high prices for this raw material with the consequence that there has been no encouragement for the development of industries basad upon alcohol as a raw material.

### The importance of low priced alcohol to industries.

48. The level at which the price of industrial alcohol should be stabilised in India is a matter of considerable controversy. Distillers have been clamouring for some time that the ex-distillery price of 14 annas per gallon prescribed under the Indian Power Alcohol Act itself is not adequate and that even if it is essential that this price should be maintained for power alcohol, whenever alcohol is to be supplied to industries, a higher level should be permissible.

One of the arguments used in favour of this demand is the fact that the price of alcohol in countries like the U. K. and the U. S. A. is of the order of Rs. 2 per gallon ex-distillery. They also point out that the lowest price for alcohol abroad is in Norway and Sweden where it is of the order of Rs. 1-4-0 to Rs. 1-8-0 per gallon in spite of the fact that the alcohol is derived as a by-product from sulphite waste liquors. The Committee feels that it would be disastrous if we are to be guided by world prices for determining the level at which the basic price of alcohol should be stabilised in India. In most other countries. alcohol produced from various raw materials has to be pooled and then distributed to industries at appropriate prices. In India the problem is simplified because molasses constitutes almost the only raw material for the production of alcohol. Fortunately, in our country, the power alcohol industry has been developed on the basis of an ex distillery price of 14 annas per gallon. It is essential that the basic price for alcohol supplied as a raw material to industries should not be higher than the present price of power alcohol. In the absence of other organic raw materials for industrial development, it is of the utmost importance that our favourable position with regard to an existing low price of alcohol should not be sacrificed because of pressure from vested interests. A low ruling price for alcohol in India in comparison to world prices does not necessarily provide any incentive for alcohol producers to export their product because of the considerable outlay involved in making arrangements for the transport of alcohol and the high freight cost due to its inflammable character. On the other hand, unless the existing low basic price for alcohol is maintained, there might be far less scope of earning foreign exchange in case of need.

### Factors governing the price of alcohol.

49. There has been considerable controversy in the past regarding the fair price that a producer of alcohol should receive and the price which industries requiring alcohol as a raw material can afford to pay. In order to arrive at an equitable price which will ensure a reasonable margin of profit to the producer and at the same time ensure a basic price for alcohol that will be low enough to secure industrial development, the following four aspects must be considered in detail :—

(a) the cost of the basic raw material, molasses, and measures to ensure its availability at a reasonable price to all producers of alcohol;

(b) the cost of production of alcohol in a modern distillery;

(c) the cost of transport of alcohol to the consumer;

(d) incidence of taxation and excise control on the price of alcohol to the consumer.

The first three aspects have been discussed in the paragraphs that follow, while the fourth aspect is considered in a subsequent chapter.

### Price of Molasses.

50. While control over the price for molasses has been introduced in some States, there is no uniformity either in the price stipulated, or in the scope of its control. In the U. P. and Bihar, control under the State Molasses Act is extended for the supply of molasses to all distilleries in the State at a price of Rs. 0-3-6 and Rs. 0-4-0 per maund respectively from sugar factories in these States. The Government of Bengal, Punjab and Pepsu also exercise a certain

amount of control on molasses in order to ensure its supply to manufacturers of potable spirit. However, for these purposes, the price fixed for molasses is much higher and rises to Rs. 1-12-0 per maund in West Bengal. The Government of Bombay exercise control over molasses mainly to ensure success of its prohibition policy and also to ensure supplies to the Government Distillery at Nasik. The price of molasses for the production of alcohol has been fixed at 4 annas per maund. Recently, the Government of Bombay has taken measures to extend the application of this controlled price of molasses independent of the Prohibition Act so as to ensure supplies to all producers of alcohol. In Bihar where a low price is stipulated for molasses supplies to distilleries, a small proportion of molasses is allowed to be sold by the sugar factories at prices which they can obtain in the open market. It is reported that small amounts of molasses can be sold in this manner at prices varying from Re. 1 to Rs. 2 per maund. The steps taken by the Government of Bombay to extend control over price of all molasses supplied for the production of alcohol has been described in some quarters as amounting to expropriation of private property. The Committee has also received representations from sugar manufacturers that they do not see why a higher price for molasses should not be paid in view of the fact that producers of chemicals from alcohol would derive large profits.

The Committee is unable to support the request either for enhancement of the price of molasses in general, or to restrict the application of molasses Acts for the production of power alcohol alone, As pointed out in para 19 (Chapter III), even a tenfold increase in the price paid for molasses will not lead to any reduction in the price of sugar, while even an increase in the price of molasses from 4 annas to Rs. 1 per maund would mean an increase in the basic price of alcohol of 6 annas per gallon. Such an increase might be disastrous from the point of view of developing industrial uses of alcohol. It must be borne in mind also, that until the development of the alcohol industry, molasses constituted a nuisance to sugar factories and instances were not unknown when factories went out of their way to pay for the disposal of molasses.

The development of alcohol based industries would at least constitute a guarantee of a certain small return to sugar manufacturers on this otherwise useless by-product. The Committee feels, therefore, that not only is it necessary to restrict the price paid for molasses to a maximum of 4 annas per maund, but that this should be done on a uniform basis throughout the country to ensure the supply of molasses to all industrial users. The price of 4 annas per maund should be applicable to molasses of the highest quality based on its sugar content. The total reducing sugars in molasses may serve as an adequate criterion for this purpose and the gradation and prices adopted in the U. P. can form a satisfactory guide. While the U. P. provides for a top grade of molasses containing 47% of total reducing sugars to be paid for at Rs. o-3-6 per maund, there is scope for providing a price of 4 annas per maund for molasses containing 50% total reducing sugars and above.

**Whether control of molasses should be under the State or the Centre.**

51. Many interests before and after formation of the Alcohol Committee have maintained that control over molasses should be exercised by the Union Government in order to ensure uniformity in its application. The Development Council for the Sugar Industry, the Indian Sugar Mills Association and the Distillers' Association have on different occasions urged the

Government to enact such measures. Apart from the aspect of uniformity, the Union Government is in an advantageous position to take suitable measures directly by the issue of Notifications under the Industries (Development & Regulations) Act, whereas State Governments may have to seek individual legislation for this purpose. This may involve considerable delay in view of the fact that prominent States like Andhra, Madras, Mysore and Madhya Pradesh do not have any Act for molasses control. Central control over molasses would also ensure adequate supplies of molasses to existing and projected distilleries in all States and thereby avoid inter-State controversies that exist today with regard to the price and availability of molasses across State borders. While an overall control of movement and prices might be exercised by the Union Government, it should be possible to entrust day to day control regarding disrribution of molasses to State agencies.

## Cost of production of alcohol.

52. It has been stated earlier that in the U. P. and Bihar the ex-distillery price for power alcohol has been fixed at 14 annas per gallon (this is for 99 5% alcohol by volume with admixture of 1% kerosene), on the basis of a price for molasses of 3½ annas and 4 annas per maund ex-sugar factories respectively. It has been contended sometimes that this price is grossly uneconomic and that the distilleries are able to eke out their existence only by the profit they make by the sale of industrial alcohol or potable spirits at higher prices. An examination of the cost of production of different units has convinced the Committee that there is no basis for this contention However, in order to examine this question thoroughly, the Committee has worked out the likely cost of production of alcohol in a unit with a capacity of one million gallons per year, i. e., a unit considered to be of economic size. The cost of production in a unit of this size established under present conditions is given in table XI. The investment and various items of cost have been worked out on the assumption that the distillery is an independent unit adjacent to a sugar factory and equipped with modern equipment, but independent of the sugar factory for any services. The cost of such a new plant will be higher than the cost at which most of the existing distilleries in the country were establised. However, such a new plant permits greater measure of economy in operational costs such as steam consumption. For the purpose of this calculation it has been assumed that a ton of molasses will produce 54.5 gallons of alcohol (expressed as 100% volume) ahd that molasses will be paid for at the rate of 4 annas per maund as recommended above.

It will be seen that after providing for a 6% return on block capital, the fair ex-works price per gallon of equivalent 100% alcohol works out to

Rs. 0-12-9 (for alcohol of strength 99.5% by volume)

Rs. 0-12-5 (for alcohol of strength 96% by volume).

In this calculation, straightline depreciation has been provided for at 10% on the original investment, viz , the rate for the first year of operation on a unit established at present day prices. The requirements of fuel and power have also been provided for on the basis of steam produced completely from coal at Rs. 35 per ton. Existing distilleries are not entitled to charge depreciation at such high rates because the written down value of their plants is very low. Some of them being situated adjacent to sugar factories, also obtain services from the parent factory at low cost. The prices worked out in the cost estimate may therefore be considered as fair and equitable ex-works prices on the assumption that no transport charge at all will be involved on molasses.

## TABLE XI.

## ESTIMATES OF THE INVESTMENT AND COST OF PRODUCTION OF ALCOHOL IN A NEW UNIT.

| A. | Capital Investment. | Plant of 1 mill. gall. capacity/year. |
|---|---|---|
| 1. | Distillation plant and equipment including all accessories and intermediate pipe lines and instruments and erection at site. | Rs. 8,00,000 |
| 2. | Fermentation and yeast plant including all accessories, and erection charges | Rs. 2,00,000 |
| 3. | Molasses handling and dilution including pumps. | Rs. 50,000 |
| 4. | Warehouse storage tanks and pumps. | Rs. 1,00,000 |
| 5. | Buildings for distillation and Fermentation plants, offices, Warehouse and storage. | Rs. 2,50,000 |
| 6. | Boiler, including Boiler House and chimney etc. (capacity 6000 lbs. steam/hr.) | Rs. 2,25,000 |
| 7. | Land. | Rs. 25,000 |
| 8. | Molasses Storage tanks (Brickwork). | Rs. 1,50,000 |
| 9. | Workshop facilities. | Rs. 25,000 |
| 10. | Water supply including pumps. | Rs. 50,000 |
| 11. | Power supply (Steam Turbine and generator 100 KWH and all accessories & fittings). | Rs. 60,000 |
| 12. | Railway facilities. | Rs. 20,000 |
| 13. | Slop disposal (sullage land & drains). | Rs. 1,00,000 |
| 14. | Additional pipe line and erection jobs. | Rs. 50,000 |
| 15. | Miscellaneous at 5% of above. | Rs. 1,05,000 |
| | Total: | Rs. 22,10,000 |

| | |
|---|---|
| Plant and Machinery Items. | Rs. 16,65,000 |
| Buildings etc. | Rs. 4,00,000 |
| Working capital required. | Rs. 2,00,000 |

Requirements of residential buildings etc ; not taken into account as they would be liable to recovery of rents.

**B. Operational Data.**

| | |
|---|---|
| Production | 10,00,000 gallons (at ·00% volume) |
| Recovery | 2 gallon of 100% alcohol per md. molasses. |
| Coal required inclusive for power. | 7 lbs. per gallon. |

Staff required: 30 to 35 persons at Rs. 3,000 per month.
4 Supervision Rs. 2,000 per month.
4 Miscellaneous Rs. 1,000 per month.

Depreciation at 10% on plant & machinery items and at 5% on buildings etc.; and (nil on land. Railway facilities and slop disposal).

Repairs and Maintenance at 2% for plant and buildings, lands and facilities.

Interest on Working capital at 5½%.

Overheads inclusive of administration, insurance, management etc. equivalent to wages and salaries.

Return on investments at 6%.

### C. Estimated cost of production.

| Item. | Rate. | Per gallon of alcohol at 100% volume. |
|---|---|---|
| Molasses | 4 as./md. | 0-2 0 |
| Coal (Steam & power) | Rs. 35/ton. | 0-1-9 |
| Chemicals | — | 0-0-9 |
| Wages & Salaries | Rs. 6,000 per month | 0-1-1.8 |
| Repairs & Maintenance | | 0-0-8.4 |
| Depreciation. | | 0-2-11.5 |
| Interest on working capital. | | 0-0-2.1 |
| Overheads. | | 0-1-1.0 |
| Total. | | 0-10-7.6 |
| Additional 6% return on block capital | | 0-2-1.2 |
| Final price for 99.5% alcohol. | | 0-12-9 |
| For Rectified Spirit (Less 4 pies on Steam and Chemicals). | | 0-12-5 per gal. of equivalent 100% volume |

### Allowance for variation in price of alcohol due to transport cost of molasses.

53. The assumption of full quantities of molasses being available without payment of transport charges may not be applicable in more than a few exceptional locations. Therefore, wherever transport of molasses is involved, it is necessary to provide for a proportionate additional charge in the price for alcohol. Every two annas in the average cost of transport of a maund of molasses will result in an increase in the cost of alcohol by 1 anna per gallon. From a study of existing and possible location of distilleries, it can be stated that the cost of transport of molasses need not be higher than 12 annas per maund anywhere. It would, therefore, be appropriate to stipulate that in addition to a basic ex-distillery price of alcohol of Rs. 0-12-9 per gallon (as 100%) for 99.5% strength alcohol, and Rs. 0-12-5 per gallon (as 100%) for 96% and higher strengths up to 99.5%, an addition up to a maximum of 6 annas per gallon based on the actual average transport charges of molasses may be permitted. The operation of a distillery with a capacity lower than one million gallons may be justified only provided the cost of production does not exceed the basic price mentioned above, plus the maximum of 6 annas allowable as transit charges for molasses. The Committee considers that this margin is more than adequate for existing low capacity and seasonal units and that the formula suggested here is applicable throughout India to ensure a fair return to distilleries.

An insistence on the price as recommended by the Committee implies in its turn an assurance of continuous allotment of adequate amounts of molasses of the required quality to distilleries to ensure operation at the installed capacity for at least 300 days and facilities for individual units to expand to a capacity of one million gallons where feasible. It would also be necessary to provide assistance in the allotment of the required quantities of coal and its movement on a priority basis.

Alcohol of 99.5% corresponds to the specifications for power alcohol, while alcohol of 96% strength corresponds to the specifications for rectified spirit of industrial grade. The Committee is aware that in certain cases alcohol of even higher purity than either of these two grades may be required by a consumer. It is considered, however, that the quantities involved of such high purity material will be small and it may be quite safe to leave such higher grades of alcohol outside the scope of price control.

54. The Committee is aware that a feeling exists in some quarters that controls on the prices and distribution of molasses and alcohol recommended above constitute very radical measures, that are not justified particularly because corresponding control over the prices of products of alcohol based industries has not been suggested. This feeling was voiced at meetings of the committee and suggestions made that the price of alcohol supplied to each industry should be linked with the profits of that industry. Apart from administrative difficulties involved in the implementation of such suggestions it is necessary to take account of two important aspects :—

(a) Distilleries have been supplying power alcohol at a price approximately the same as the reasonable price estimated in this chapter. Their clamour that this is a distress price is not borne out by the data on cost of production of typical units and in view of the large number of applications received by Government for expansion of existing distilleries or for establishment of new units, as well as the margin available for effecting savings by more efficient operation.

(b) Establishment of alcohol based industries involve very heavy capital investment and it is not possible to attract investment or technical 'know-how' unless the entrepreneur is guaranteed a stable, low price for his principal raw material.

In view of these considerations, the Committee feels that taking a long term view, it is in the interest of all concerned that the price of alcohol should be pegged down in the manner indicated in this chapter. If, after establishment of alcohol based industries it is found that the products are sold with a very high margin of profit, such prices can be maintained at reasonable levels with powers inherent under the Indurtries Act. Alternatively the levy of suitable excise duties either on alcohol supplied as raw material to chemical industries or on the products of the industries can be considered in the future so as to mop up excessive profits. In any case, the Committee can find no justification for recommending higher ceiling prices for alcohol or molasses for the present.

### Cost of transport of alcohol.

55. In a country of vast distances like ours, in which production of alcohol can be established only in some States where molasses is available, the cost of transport of alcohol assumes great significance from the point of view of development of industries. At present, alcohol is chargeable at different rates by the Railways depending upon the strength and type of alcohol as given below:—

(i) Denatured industrial alcohol:

Class X under Railway risk.

Class VIII under Owners Risk.

(ii) Rectified Spirit:

Class XV under both Owners and Railway Risk.

(iii) Power Alcohol:

Class XIV under Railway Risk.

Class XII under Owners Risk.

It is important to note that the freight chargeable under Class XV is the highest under the Railway Tariff and that its application results in the cost of transport of rectified spirit of as much as 6 annas per gallon over a distance of 300 miles or 50% of the ex-distillery price suggested above. The cost of transport of denatured spirit is appreciably lower and works out to about half the cost of transport for rectified spirit. The freight for power alcohol is that applicable for petrol and works out to about 14 pies per gallon per 100 miles on an average. In considering this question the Committee desires to record that the present system under which the higher rate of freight is charged on rectified spirit and on power alcohol in comparison to denatured spirit requires to be altered immediately. The system is probably the survival of the days when it was considered that rectified spirit was used mainly for the production of alcoholic liquors or other spirituous medicinal preparations. Since these products could be sold easily at a higher price, there was no reason why the Railways also should not charge a higher rate for rectified spirit. However, the position is likely to change substantially in the near future. Alcohol will be required for various industrial purposes to the extent of 30 million gallons per year. In a chemical process it is not always practicable to use denatured spirit in place of rectified spirit because denaturants may poison catalysts, or give rise to undesirable side reactions, and thereby reduce the yield of the desired product. It is not possible either to state in advance the particular industries where rectified spirit would require to be transported in preference to denatured spirit. It is also likely that some manufacturers may desire to transport rectified spirit under bond and denature it in their own premises with specific denaturants. Such parties should not be penalised by having to pay higher freight on rectified spirit. Considering the scale of expansion in the use of industrial alcohol that is envisaged, it would not be reasonable for the Railway Authorities to insist that each user of rectified spirit should make out a case for being allowed reduced freight rates on such spirit. It is, therefore, essential that conditions for fresh developments based on alcohol should be created by ensuring a uniform freight charge for all types of alcohol. including power alcohol by the Railways.

The Committee has received several representations claiming that the actual rate for transport of alcohol should be as low as possible consistent with its use as a raw material for industries. The Committee is in sympathy with this request and therefore it suggests that all grades of alcohol, including power alcohol, may be included for transport under Class X under Railway Risk or Class VIII Owners Risk, i. e., the rates now applicable for denatured industrial alcohol.

# CHAPTER VI

## Tax On Alcohol

### Present position

56. At the present time tax on alcohol is levied by the Union or State Government depending upon the type of the product. Power Alcohol is subject to a Central Excise Duty corresponding to the duty on motor spirit. Industrial Alcohol is liable to excise duties imposed by State Governments and in the denatured form it is often subject to alternate or additional charges such as permit fees, vend fees, etc;, also collected by the State Governments. The facility to use duty free rectified spirit and denatured spirit without payment of permit or other fees has sometimes been allowed by State Governments for specific industrial uses. The Union Government have also granted an exemption from Central Excise Duties for power alcohol when it is to be utilised as a raw material for approved industrial processes. Some State Governments, however, treat power alcohol used for such purposes as denatured industrial alcohol, and have not found it possible to extend a corresponding exemption from the payment of vend fees, permit fees and such other charges. Further, the rates at which excise duty is levied on rectified spirit or the amount of vend and permit fee charged on denatured spirit are far from uniform in the various States. Variations in procedure adopted by different State Governments in the administration of duties and vend fees etc., also add to the difficulties.

### The constitutional position regarding the power to levy tax by the Union and State Governments.

57. According to entry 51 of the State List in the 7th Schedule to the Constitution for India, the State Governments have the power to levy duties of excise on "alcoholic liquors for human consumption but not including medicinal and toilet preparations containing alcohol". Another entry 54 in the Union List of the same schedule confers on Parliament the power to levy duties of excise on "tobacco and other goods manufactured or produced in India except alcoholic liquor for human consumption ···· but including medicinal and toilet preparations cantaining alcohol······." This Committee has been advised by the Law Ministry that the fact that rectified spirit or absolute alcohol can, after some dilution or other treatment, be consumed internally as an alcoholic beverage was not enough to make it "alcoholic liquor for human consumption" within the meaning of Entry 51 of the State List. Any other interpretation to bring industrial alcohol within this meaning would render the words "alcoholic liquor" and the words "for human consumption" practically meaningless. The opinion of the law Ministry was conveyed by the Committee to the State Governments for their comments. Some of the State Governments are not prepared to accept the opinion as final and binding. Also some other State Governments while conceding the right of the Union Government to tax alcohol other than "alcoholic liquors for human consumption", have suggested that the collection of such a tax at rates prescribed by the Union Government may be entrusted to the State Governments and the amounts realised thereby permitted to be retained by the latter in order to compensate them for the loss of revenue involved in acceptence of the principle. In view of the divergence of opinion, the Committee is not in a position to express any definite view. It wishes to stress, however, that if the efforts for promotion of a substantial increase in the consumption of alcohol for industrial purposes are to succeed, it is essential that the Uion and the State Governments attempt to find out a solution to this controversial subject and ensure the evolution of a uniform taxation policy and procedure with respect to

rectified spirit and industrial alcohol. The Committee recommends that it is necessary that the Union Government alone is empowered to levy excise duties on industrial alcohol because, apart from the uniformity in the rates of taxation which such a step would automatically ensure, it would also lead to the possibility of levying taxation at the source of production of alcohol and remove completely the difficulties of taxation inherent in the system of taxes collected from the consumer by the State Government.

The Members of the Committee from the Bombay and U. P. States, viz., Shri Jasjit Singh and Shri Pat, however, strongly disagreed with the above suggestion and stated that in view of the fact that excise is one of the major flexible sources of revenue to the State Governments, it would not be desirable to do anything which would substantially impair this source of revenue or the machinery created for its realisation. If, however it is finally decided that the Union Government alone have the power to levy a duty on industrial alcohol, they urged that its administration and the entire preceeds thereof be left with the State from which it is collected.

### Need for uniform taxation policy and procedure.

58. While considering the need to enforce a low basic price for alcohol in order to stimulate industries based on alcohol as a raw material it has been pointed out in the previous chapter that while the basic price paid to distilleries may remain uniform, it should be possible to devise a scheme of graded taxation depending upon the ability of the industry to pay duty. There is already in existence a provision for the levy of a uniform duty at the rate of Rs. 0-15-9 per gallon of power alcohol by the Union Government. As a result of the Sattanathan Committee's recommendation, the Spirituous, Medicinal and Toilet preparations ( Excise Duties ) Act, 1955, has been passed by Parliament recently empowering the Union Government to levy tax on alcohol in such preparations at the rates of Rs, 5 and Rs. 17-8-0 per proof gallon for different categories. The Committee hopes that in the near future it will be possible to have Central Duties on ethyl alcohol, irrespective of the name by which such alcohol is called or the purpose to which it is put. The rates of duty applicable to alcohol in an individual case may vary, depending upon the use to which the alcohol is intended to be put as indicated in the next para. Such duties should cover power alcohol, ordinary denatured spirit for miscellaneous purposes or industrial alcohol, denatured or undenatured, for specified industrial uses. Wherever rectified spirit is to be diluted or blended or treated in any other manner for conversion into "alcoholic liquor for human consumption", then at the stage where such treatment takes place, the State Government may continue to levy State Excise taxation as at present.

### Suggested variation in duties for alcohol used for different purposes.

59. The different uses to which industrial alcohol may be put have been indicated in detail in Appendix V. The Committee recognises that for certain categories of uses a higher price for alcohol would not constitute a deterrent to its consumption and that the difference between the basic price and the higher price may serve as a source of revenue to Governments. In order to devise a scheme for the purpose, the Committee envisages the following broad classification to signify the different uses of alcohol :—

(A) Those in which alcohol is destroyed or converted chemically in the process into other products and where the product does not contain alcohol,

(B) Where the alcohol is used under Bond only as a solvent or processing agent and again the product does not contain alcohol.

(C) Where the alcohol appears in the final product to some extent, but the product is in-capable of use as an intoxicant, and

(D) Where alcohol appears in the final product to some extent and the product is capable of use or misuse as an intoxicant.

Industries included in category 1 of Appendix V conform to the classification(A)and therefore the Committee feels that such industries should be able to obtain their supply of alcohol without payment of duty and permit and vend fees, and preferably with the minimum of Excise control. A relatively small duty may be charged for purposes indicated under category 2 of Appendix V, corresponding to classification (B) above. Uses indicated under (C) above are covered by category 3 of Appendix V and in this case a somewhat higher rate of excise duty may not be a deterrent to production. Even here, however, it is felt that the price of alcohol to the consumer should not rise above a figure higher than 100% of the basic price for alcohol recommended in Chapter V. With reference to uses under (D), corresponding to category 4 in Appendix V, the use of alcohol might lead to abuse and violation of Prohibition Laws and the products are generally sold at comparatively high prices. It is justifiable, therefore, not only to charge higher rates of duty than for purposes under (C), but the Excise Control also will have to be more rigorous in order to prevent abuses. There is scope for further gradation in taxation for uses recorded in this category. With regard to uses enumerated in category 5 of Appendix V, which also corresponds to classification (D), it is desirable that the duty should be lower than that for category 4, because otherwise uses in this sector may not develop to the extent desired.

In the above recommendation for levy of excise duty at different rates, it is to be understood that the term excise duty covers any direct tax or duty as well as other forms of charges like permit fees, vend fees, gallonage fees, etc. that have been levied from time to time by Governments.

## Necessity to reduce incidence of permit or vend fees to a token value.

60. Several references have been made so far to levies of permit and vend fees that are prevalent in many States. The Committee has been advised that such fees can be charged legitimately only where some distinct service is rendered to the licencee and that it is not lawful to collect such fees to compensate Government for costs incurred for the administration of Excise Laws. Whatever the legal position, the Committee feels that such fees add unnecessarily to the cost of an important industrial raw material and therefore if they are to be charged at all, they should be charged only at token rates that are uniform throughout the country. It is hoped that State Governments will give earnest consideration to this factor in the interest of rapid development of alcohol based industries.

## CHAPTER VII

## REGULATIONS GOVERNING PRODUCTION, DISTRIBUTION, POSSESSION, TRANSPORT AND USES OF INDUSTRIAL ALCOHOL.

61. The problem of control and regulation concerning production, distribution etc. of alcohol divides itself into three distinct aspects :—

(a) Taxation on alcohol and safeguarding of Government revenues.

(b) Control over production and distribution for promotion of industrial development, and

(c) Control over alcohol as a commodity that is liable to misuse as an intoxicant.

The major question of taxation has already been dealt with in the earlier chapter and it may be necessary only to touch upon one or two administrative problems relating to this aspect. After analysing the present position which exists in regard to these controls, certain suggestions have been made for facilitating industrial development without sacrificing any of the essential safeguards required.

### Present position regarding control over production

62. Existing regulations governing the operation of distilleries in some of the States were formulated primarily for the control of distilleries producing potable spirits. Subsequently, they were applied to all types of distilleries irrespective of any consideration whether the products were potable spirits, industrial alcohol or power alcohol. The revenue angle is paramount with regard to potable spirits and this aspect assumes predominance in the framing of excise regulations. Distilleries are licensed only after careful scrutiny and approval of the premises and equipment, particular care being bestowed on eliminating possible sources of leakage from the plant, or theft from the premises. The parts of equipment containing alcohol in a dilute or concentrated form are safeguarded from unauthorised manipulation by provision of excise seals. Detailed procedures are prescribed and enforced for the verification of data relating to the use of raw material for fermentation and distillation, and for the verification of production from time to time, generally at short intervals of three to four days. The entire premises are under the control of Excise Officers and the warehouse is open for transactions, including that of transfers of spirit between vats, denaturation, issues etc., only during specified hours in the day and that too under direct excise supervision. The procedure for guaging of vats and the maintenance of records of stocks and wastages are prescribed, and so are the permissible limits of wastage. A certain measure of control over persons employed in the distillery as well as on those entering the distillery for business purposes, is also exercised. A distillery and its warehouse are allowed to be establishad only in closed buildings. Even minor alterations to plant and buildings including repair work, require prior permission of the Excise Authorities The actual procedures differ to some extent from State to State, but they conform generally to the above pattern.

### Suggestions for revision of regulation governing production of power & industrial alcohol.

63. In the light of discussions in previous chapters, it is desirable to have uniform regulations for the control of power and industrial alcohol distilleries

throughout the country. Such regulations can perhaps be drafted and enforced as part of the Central Excise Rules, if and when industrial alcohol is considered as an item excisable by the Union Govt. alone. As this question still remains open, the Committee feels that existing regulations in various States governing the production of power and industrial alcohol ought to be revised so as to ensure smooth and uninterrupted operation of distilleries of modern design and providing *inter alia* for

(i) A certain measure of latitude to carry out adjustments or urgent repairs of equipmment, not involving major alterations in the plant and layout, with the permission of the Resident Excise Officer.

(ii) Determination and recording of technical data relating to the operation of distilleries on a uniform basis throughout the country, linking production more closely with the consumption of raw materials, on lines suggested to State Governments in 1954, by a Committee of Experts constituted by the Development Wing ( copy at Appendix X ).

(iii) Maintainence of certain norms of efficiencies in the operation of distilleries – both in regard to consumption of raw materials and coal.

(iv) Replacement of the system of "complete outturn" in force in many States whereby production is required to be suspended for several hours for purposes of stock taking, with a more flexible system of recording production from day to day in relation to raw materials consumption.

(v) A certain measure of freedom in respect of installatoin of warehouse tanks and the procedures for reckoning the quantities of alcohol.

(vi) Installation of fermentation tanks and warehouse storage tanks in the open with adequate safeguards like barbed wire fencing all round.

(vii) Facilities to introduce improved methods of fermentation like the continuous system, recirculation of yeast, etc.

**Present position regarding control over distribution.**

64. At the present time, sale of industrial alcohol by distilleries as well as its purchase for use by a consumer require separate licences under State Excise Acts, and further the handling and transport from a licensed seller to a licensed consumer for each single consignment is regulated by individual permits or passes. The alcohol is subject to supervision by the excise authority both at the time of issue and at the time of receipt, and also during storage and consumption at the consumers' premises. The supervision is naturally greater in the case of rectified spirit because it can be more easily misused. Rectified spirit can be used by a consumer only under bond and losses beyond a specified maximum of one to two per cent, are liable to be charged high rates of duty. Wastages also occur during transit, and if they are in excess of allowances fixed for such wastages under Excise Rules, they are also liable to similar high rate of duty. Wholesale and retail distribution of denatured spirit for general purposes is governed also by similar licences and permits. Dutyfree spirit can be obtained by hospitals, research laboratories and certain Government and educational institutions as a special

case. As pointed out earlier, the Government of Bombay exercises a monopoly on rectified and specially denatured spirits, by restricting their sale only through the State owned Nasik Distillary. A tendency to make use of the permit system to curtail inter-State trading in industrial alcohol has also been noticeable on the part of some States. It is obvious, that at present, conditions of a free market do not operate in the case of industrial alcohol.

## Applicability of the Industries (Development & Regulation) Act.

65. Regulation of production and distribution of industrial alcohol is envisaged under the Industries (Development & Regulation) Act. However, while factories producing power and industrial alcohol have been registered or licensed under the Act, other measures like control over the distribution and price of industrial alcohol have not been adopted so far. The discussion so far has indicated that it is essential to control the price of industrial alcohol in order to secure the development of various alcohol-based industries to the required extent. Such control can be exercised most appropriately under the Industries (Development & Regulation) Act. In view of the confusion that is prevalent because of control exercised under State Excise Acts over industrial alcohol, as discussed earlier, it seems necessary that the distribution of industrial alcohol should now be brought under the purview of the Industries (Development & Regalation) Act. In the first place, there should be unrestricted movement of industrial alcohol across inter-State borders subject only to the usual excise control. Next, production of alcohol in the most suitable areas should be correlated with the needs of consuming industries located elsewhere. The supply of power and industrial alcohol must be integrated so as to ensure equitable distribution of available markets to producers from all areas. Another most important problem would be to ensure adequate supplies of alcohol to industries, whose establishment is specifically encouraged by Government for the purpose of greater utilisation of alcohol as an industrial raw material.

## Suggestions for securing the required co-ordination between production and distribution

66. It is necessary to formulate suitable measures for overall control over the distribution of industrial alcohol under section 18(G) of the Industries (Development & Regulation) Act, so as to secure the necessary degree of correlation between production and demand and to guarantee the supply of alcohol at reasonable prices to essential industries. This could be done effectively by the Union Government deciding the broad policy so as to ensure supplies to certain categories of industries and after deciding on the quotas essential for such industries, leaving it to State Governments to organise the details of actual distribution. The distribution of surplus industrial alcohol may be left to be regulated by the State authorities as they deem fit but subject to the overall stipulations regarding price and taxation as recommended earlier.

## Prevention of misuse of industrial alcohol.

67. The Committee recognises that free movement and use of alcohol are not permissible even after payment of the relevant tax. Control over alcohol is necessary, because, even when denatured, it is liable to misuse for potable purposes, resulting either in direct loss to revenues of a State Government or in the violation of State Prohibition Acts that may exist. Prevention of either type of abuse is a subject over which the States Governments have

a considerable amount of jurisdiction. Such jurisdiction would apply even when taxation of industrial alcohol is conceded as the sole responsibility of the Union Government and the production and distribution of industrial alcohol is regulated under the Industries (Development & Regulation) Act. It would be necessary that such jurisdiction of State Governments should be integrated with the need for encouraging industrial development based on alcohol. Some specific aspects deserving considerations are dealt with below.

### Licences and permits.

68. Licences for production and use would continue to be necessary under State Excise or Prohibition Acts. However, the conditions attached to such licences or permits should not conflict with the objectives of the Industries (Development & Regulation) Act.

### Wider scope required for use of special denaturants

69. Industrial alcohol should be used in the denatured form as far as possible. It may be desirable to permit the use of a wide range of denaturants depending upon various processes for which alcohol is to be utilised. A list of such denaturants indicating their suitability for specific purposes is given in Appendix VIII. Additions to this list may be made as and when necessary after consultation between the consumer concerned, the Chief Chemist, Central Board of Revenue, the State Excise authorities and the Chief Industrial adviser. While industrial alcohol may be used mostly in the denatured form, it is important to permit the use of rectified spirit in industries wherever essential with appropriate safeguards such as use "under bond". Similar additional safeguards would also be required in cases where after use the alcohol is recovered by distillation or other means and reused. The regulations ought to provide for denaturation in consumer's premises also, because such a facility may be essential in the case of special denaturants which cannot be transported or handled easily.

### Specifications for denaturants and procedure for approval.

70. Specifications for various denaturants may be fixed by the Chief Chemist, Central Board of Revenue, in consultation with the State Excise authorities and the Chief Industrial Adviser. It would be necessary to have each batch of denaturant tested and certified as conforming to the required specifications, prior to its addition to industrial alcohol. However, the system prevalent in some States requiring the certification of denatured spirits also by the Chemical Examiner before issue from distilleries, is not considered necessary. A procedure corresponding to the system of issues of power alcohol may be adopted in the case of most industrial alcohols including ordinary denatured spirits. So long as denaturants are of the desired specifications, an Excise Inspector at the distillery could satisfy himself that the required proportions of denaturants are used before issue of the alcohol. A system of surprise checks by superior officers from time to time should be adequate to ensure compliance with the regulations.

### Permit for each individual consignment not considered necessary.

71. In the case of large consumers of industrial alcohol it may be difficult to provide for the supply of industrial alcohol by issue of permits against each consignment. It may therefore be necessary to develop a more flexible system whereby such consumers could procure the required quantity of industrial alcohol on the basis of a quota and licence allotted to them without

seeking separate permits for each consignment. An Excise Inspector at a distillery can varify that issues are made only in favour of licencees as per quantities and specifications given in their licences and issue transit passes with all necessary details and a check could be exercised at the consumer's premises by another officer.

### Wastages in issue and transport of industrial alcohol.

72. Limits of wastages at present allowed under the State Excise Regulations covering issue and transport of rectified and denatured spirits appear to be adequate. The grievance has been expressed that users of such spirits are made liable to pay duty at the highest admissible rates on wastages in excess of prescribed limits. The Commitee recognises that, in the interest of prohibition as well as of excise revenue, a check should be exercised on excessive wastages but the Committee hopes that whenever a duty is levied it should be moderate except in cases where fraud is suspected. The provision that issues of rectified spirits may be made only when the consumer is under bond to the State Governments would facilitate control over wastages.

### Suggestion for promotion of domestic and general uses.

73. It is suggested that a maximum limit of half a gallon of completely denatured spirit may be allowed to be purchased and kept by the general public for the domestic and other uses. It is considered that a system of permits for very small quantities of denatured spirits required for heating or lighting purposes in homes, that exists in some States is not helpful from the point of increasing consumption of alcohol in all forms. All that is possible may be done to prevent abuse viz., by employing denaturants which are highly injurious to health (though not wholly poisonous) like crotonaldehyde in addition to those already in use.

### Use of rectified spirit for spirituous medicinal and toitet preparations.

74. The use of alcohol in the manufacture of spirituous medicinal and toilet preparations is sought to be regulated under the Spirituous Medicinal and Toilet Preparations (Excise Duties) Act which is likely to be enforced in the near future. This Act envisages the taxation of such preparations on the basis of uniform rates of duty which are applicable for these classes of preparations depending upon the possibility of misuse or otherwise. This is leviable on the alcohol content of the preparations. The supply of rectified spirit for such manufacture would also be regulated by suitable action, and as the preparations made therefrom are taxable, normally tax free rectified spirit would be supplied under bond. However, if conditions warrant it, rectified spirit used as a raw material in this industry may also be subject to an appropriate tax.

# CHAPTER VIII

# ARRANGEMENTS FOR USE OF POWER ALCOHOL

### Alcohol to be used as power alcohol.

75 It has been brought out in earlier chapters that for some years to come it will be necessary to continue the use of power alcohol in motor fuels in spite of the concerted efforts planned for development of alcohol based industries. The facilities available at present for mixing approximately 10 million gallons of alcohol a year with petrol have been indicated in Table VI. It is clear that it will be necessary to provide for absorption of almost the same amount of alcohol every year for many years to come, although the regions in which alcohol will be available for admixture with petrol will vary from time to time depending upon the establishment of industries indicated in Table X In other words, while it may be necessary to discontinue the use of power alcohol in some areas in which the Power Alcohol Act applies today, mixing facilities may have to be created elsewhere as soon as production is organised on a substantial scale. For example, when the proposed factory for the production of synthetic rubber is established in the U. P. and begins to consume between 11 and 12 million gallons of alcohol a year, and the polyethylene project at Rishra begins to consume alcohol to the extent of over 2 million gallons from the U. P. and Bihar, it would be necessary to withdraw the Power Alcohol Act from certain areas. On the other hand, it is expected that a total production of 7 million gallons will be organised in the State of Bombay and about 3 million gallons will be drawn from the Ahmednagar District by another polyethylene project and an acetate rayon factory in Bombay. When these developments materialise, it will be necessary to withdraw the application of the Power Alcohol Act from the Nasik District and make it applicable perhaps in Sholapur and Kolhapur Districts. A full picture of the anticipated production in different regions as well as the amounts of alcohol expected to be utilised for industrial purposes and the surplus available for disposal as power alcohol have been indicated in Table X. The position of existing mixing depots and passible locations for additional depots that may be required in the future have been indicated in Table XII.

76. Fulfilment of a programme of disposal of power alcohol as outlined in the paragraph above would depend on successful co-ordination of many factors. In the first place, it would be necessary to ensure uninterrupted supplies to all the mixing depots that may be in operation at a given time. Today, the responsibility for maintaining supplies rests entirely on the Excise Officers posted at these depots The Officers take charge of stocks of power alcohol until their admixture with petrol and release for sale of the mixed fuel, but any losses of alcohol during storage or transit have been borne by the supplying distillery. Creation of new depots will involve additional expenditure and there is likely to be a complaint from the Petroleum Companies if they are required to have storage facilities at different places each year. The cost of handling power alcohol charged today by the Petroleum Companies has also come in for considerable criticism and this criticism is likely to be sharper when the price for alcohol worked out in this report is stipulated as the standard price throughout the country. On considerations of these, and other factors of organisation, the Committee feels that, instead of the complicated organisation that has been in operation so far for the disposal of power alcohol it is now desirable to evolve a system under which the Government is responsible for the overall planning of the alcohol industry and the Distilleries and Petroleum Marketing Companies are entrusted with greater responsibility for day to day working of the programme for disposal of power alcohol.

## TABLE XII

## EXPECTED SURPLUS ALCOHOL FOR ABSORPTION AS MOTOR FUEL.

| Place where produced. | | Quantity of surplus P/ Alcohol Gall/ month. | Mixing centres where it could be utilised. | Economic position. | Remarks |
|---|---|---|---|---|---|
| Hamira<br>and Khasa<br>or Jagadhri. | Punjab<br>,,<br>,, | 100000 | Depots in Punjab. | Economic | To be arranged when production is developed at these centres. Till then supplies from U. P. to continue. |
| Shamli<br>Pilkhani | U. P.<br>,, | 150000 | Depots in West U. P. | ,, | — |
| Nawabganj<br>Captainganj<br>Sardarnagar | U.P.<br>,,<br>,, | 200000 | Depots in East & Central U.P. like Benaras, Allahabad, Lucknow, Kanpur, Gorakhpur etc. | | Balance of production at these centres to be diverted to Rishra. |
| Other U.P. distilleries. | U.P. | Nil | — | — | Production to be diverted to the Butadiens plant from 1960. Till then all other depots of U. P., Delhi, Punjab, V. P. etc. to continue as at present. |
| Hathua<br>Pachrukhi<br>Narkatiaganj<br>Samastipur. | Bihar<br>,,<br>,,<br>,, | 100,000 | Depots in North Bihar and Patna, Gaya & Bhagalpur. | Just economic. | Balance of production to go to Rishra and Dhanbad to be discontinued. |
| Ratlam | M. P. | 35,000 | Ratlam & Indore. | Economic. | When production develops. |
| Nasik | Bombay | 20,000 | Nasik | Uneconomic | To be discontinued when the Nasik distillery in shifted. |

| | | | | | |
|---|---|---|---|---|---|
| Kolhapur<br>Sholapur<br>Ahmednagar<br>Walchandnagar<br>Phaltan | Bombay<br>,,<br>,,<br>,,<br>,, | 200000 | Depots at these places & near by areas. | Marginal and some uneconomic. | To be introduced when production develops. |
| Bodhan | Hyderabad | 50000 | Hyderabad/ Secunderabad | Economic | To be reintroduced when production is increased and part suppy to Sirsilk arranged from Vijawada. |
| Vuyyuru<br>Vizagapatnam Distt. | Andhra<br>,, | 50000 | Vijyawada Rajahmundry & nearby areas. | Uneconomic | To be introduced when production develops. |
| Mandya | Mysore | 40000 | Bangalore | Economic | To be reintroduced temporarily till the cellulose acetate project is taken up. |
| Nellikuppam | Madras | 50000 | Cuddalore & areas. | Marginal | To be taken up when production is increased. |

77. In this respect, it would be interesting to consider the practice in vogue in other countries. Sweden, Finland, France and Australia are some of the countries in which considerable amounts of power alcohol are used. These countries employ a flexible system under which, from time to time, the Government stipulates the amount of alcohol which the Petroleum Marketing Agencies must absorb for sale in admixture with motor fuel. The Petroleum Marketing Companies are then asked to make their own arrangements for taking over the stipulated amount from distilleries and organising its sale in any manner they consider feasible. Sometimes an alcohol petrol blend is sold as a superior grade of gasoline with a higher octane value, at a price slightly higher than that for straight petrol. While the price which has to be paid to distilleries for the alcohol is determined and fixed by Government, adjustments in the selling rates of alcohol petrol blends as well as in the rate of levy of excise duty on such mixtures are also determined by Government in order to avoid loss to the Petroleum Marketing Companies.

78. The Committee feels that it is now necessary to devise a similar flexible system for organising the sale of power alcohol in India. The revised system should include the following features :—

(i) The Oil Companies should make arrangements for taking over directly from the distilleries, instead of through State Governments as at present, the stipulated amounts of alcohol allotted to them each year. The companies should keep accounts relating to all transactions such as purchase of alcohol, handling and transport charges and the price realised by sale, any surplus being handed over to Government.

(ii) The Oil Companies may be given the option to dispose of power alcohol either as a blend in admixture with petrol, or as a special high octane superior grade fuel, or as a substitute to replace tetra ethyl lead in petrol. In other countries, propaganda by alcohol producers and Petroleum Marketing Organisations has succeeded in persuading customers to buy alcohol petrol blends even at a higher price. There is no reason why this practice should not be developed in India with the co-operation of the Oil Companies.

(iii) A more effective denaturant like crotonaldehyde (0.5%) may be used in order to reduce the need for continuous on the spot supervision over the operation of mixing depots.

79. The above suggestions were discussed with representatives of the Petroleum Marketing Companies during a sitting of the Committee. The Committee regrets to record that the response of Petroleum interests has been very lukewarm towards all proposals which place additional responsibility on them for maitaining accounts of the power alcohol scheme. It is to be hoped that these interests will re-examine the question in the light of the many considerations that have been brought out in this report, which show the necessity for continuation of the power alcohol scheme as a balancing pivot in an overall programme for the development of alcohol based industries.

## CHAPTER IX

## MISCELLANEOUS CONSIDERATIONS

80. Throughout its discussions the Committee has felt the need to arrive at a clear line of demarcation between various grades of alcohol, or the more commonly used term "spirit". Current Excise regulations cover every grade of alcohol that may be derived by distillation under the term "spirit", whether such alcohol is intended to be used for human consumption as alcoholic liquor or it is produced at a high strength for industrial purposes. It is desirable that the term "alcohol' should be used now exclusively for any type of alcohol of strength 66° overproof or above, and all other types of alcohol be referred to as "spirit". Such a clear distinction in the two definitions would make it possible to extend assistance and facilities exclusively to producers and users of power and industrial alcohol as against the manufacturers of potable alcoholic liquors.

81. The Committee wishes to emphasise that the scope of control and taxation of alcohol or spirit should be confined scrupulously to ethyl alcohol alone. The anomaly under which non-potable alcohols such as methyl, amyl or butyl alcohols are either charged duty at the same rates as ethyl alcohol or suggestions made that they should be denatured before use should be removed. Recently, on the advice of the Excise Expert Committee that all higher and lower alcohols should be kept outside the purview of Excise Acts, the Ministry of Finance have issued a notification exempting methyl alcohol from the purview of the definition of "spirit", for purposes of levy of customs duty. In the Committee's view, it is essential that a similar notification exempting higher alcohols such as isopropyl, amyl, butyl, etc. which are neither potable nor intoxicants, should be issued immediately and that this practice should be followed both by the Union and State Governments. Another special product which deserves mention from the point of view of exemption from application of the Excise Act, is fusel oil. The main constituents of fusel oil, which is a by-product of the alcohol industry, are propyl, butyl and amyl alcohols in varying proportions and a very useful solvents industry could be based on the proper utilisation of fusel oil. Such development would be assisted considerably if fusel oil containing less than 12 proof gallons per cent of ethyl alcohol is rendered free of all excise controls. It may be added that removal of excise control over fusel oil of the alcohol content indicated is not likely to lead to abuse of the provisions of the Prohibition Acts because isolation of potable alcohol from such fusel oil is an extremely difficult, if not an impossible proposition.

82. Considerable emphasis has been given already regarding the adverse effect arising from permit and vend fees imposed by State Governments on alcohol. It is also necessary to record that the cost of Excise supervision is oftentimes a burden on the alcohol producer. In view of the positive effort that is being made by Government to promote development of the alcohol industry, the Committee recommends that the burden of Excise supervision should be taken off from the alcohol producer by the State Governments as their contribution towards assistance to this industry. There is a precedent for such action in that in the U. P., which is the principal producer of alcohol, the cost of Excise supervision is borne by the State Government.

83. In the past sometimes difficulties have arisen because of dual control over alcohol producers exercised by the Union and State Excise Departments. Even if the recommendation of the Committee that alcohol should be made taxable by the Union Government alone is accepted, to a certain extent dual control may be necessary because of the jurisdiction of State Governments

to prevent abuse or misuse of alcohol in their territories. Numerous suggestions have been made to the Committee that the entire control over a distillery, both on behalf of the Union as well as the State Government, should be entrusted to a single officer. The Committee has considerable sympathy with this point of view and it feels that it should be possible to devise a system under which any single distillery may work under the sole supervision of either the Central or the concerned State Excise Department and that an officer of this Department should ensure that conditions governing the production and handling of alcohol laid down by the State as well as the Union Government are adhered to by the distillery. A similar procedure should be evolved also for the supply of alcohol to industrial consumers where either the alcohol is supplied free of duty or it is liable to a low rate of duty.

84 Representations were made to the Committee that Sales Tax and other local taxes levied on industrial alcohol should be abolished since the alcohol would be used as a primary raw material The Committee hopes that it will be recognised generally that in order that alcohol based industries should develop rapidly on a large scale, it is essential to keep down its price to the lowest possible level and therefore any Sales Tax, if it must be levied, should be kept to the lowest possible level consistent with the above objective.

85. To ensure success of the programme of development for the alcohol industry outlined in this report, it is of paramount importance to arrange for an adequate number of tank wagons over the Railways for transport of ever increasing amounts of molasses, alcohol, as well as products derived from alcohol. Steel tank wagons are adequate for molasses and alcohol but for alcohol based products, it may be necessary to provide tank wagons made of aluminium, stainless steel or other special materials of construction. It is difficult to give today an exact estimate of the requirements of such tank wagons by a particular date. However, the approximate movements of materials have been worked out in Appendices VIII and IX, for the guidance of the Railway Authorities The Committee wishes to stress that provision of tank wagons in adequate numbers should be regarded as a developmental expenditure and therefore arrangements should be made to procure them in anticipation of the need.

86. It has often been urged by commercial interests that facilities should be provided for export of surplus molasses and/or alcohol. It may be mentioned that despite the fact that alcohol is on O. G L., the amount exported to Ceylon, Burma and other places in the form of denatured spirit is not more than about 300,000 gallons per year It must be conceded, however, that if the price of alcohol is brought down in the manner discussed in this report, and special facilities are provided for its quick and inexpensive transport to ports, it may be possible to develop a reasonably large export market in Australia and other countries. While exports may not amount to a very high figure as a normal occurrence, an offtake of a million gallons or more for this purpose, even temporarily, may provide a stimulus to greater production of alcohol. Therefore, the Committee feels that every assistance should be given to exporters of alcohol and all procedural difficulties in this respect should be reduced to the minimum.

87. The magnitude of the alcohol industry and the many problems, whose solution requires the co-operation of producers and users of alcohol as well as that of the Union and State Governments, make it necessary that there should be an agency for periodical discussion of the problems of this industry.

The Committee recommends therefore that a Development Council for Fermentation Industries including alcohol and products obtained therefrom, should be constituted as early as possible.

88. During the course of the work of the Committee it was noticed that statistics with respect to consumption of alcohol in various industries could not be obtained readily. Since all consumers are governed by a system of licences from State Governments for procurement of their alcohol, it is desirable that these Governments should arrange for compilation of statistical data industry-wise with regard to all alcohol consumed in their States and supply this information to the Development Wing, Ministry of Heavy Industries, from time to time.

89. It has been suggested in para 78 that in future the Petroleum Marketing Companies should be entrusted with the work of maintaining accounts regarding distribution of power alcohol in motor fuel. Any profit arising from the scheme should be handed over to Government.

# CHAPTER X.

## Summary of conclusions and recommendations.

1. Consumption of alcohol for industrial purposes amounts only to 3 to 4 million gallons per year at the present time. The scope for increased use of alcohol for such purposes has been analysed and major projects based on alcohol as a raw material that should be encouraged on a priority basis have been indicated. If all these projects materialise, their requirements of alcohol would amount to over 31 million gallons per year (para 34, Appendix V and Table VII).

2. The present annual consumption of alcohol as power alcohol is of the order of 10 million gallons. Even when alcohol based industries develop, it will be necessary to continue to use power alcohol in admixture with petrol so as to provide a flexible demand to cover any imbalance between anticipated production and gradual development of industrial demand for alcohol For several years to come, it will be necessary to arrange for the utilization of about 12 million gallons per year as power alcohol. (paras 36 & 44.)

3. The principal raw material for the production of alcohol will have to continue to be molasses from sugar factories. The availability of molasses estimated on the basis of the programme envisaged for expansion of the Sugar Industry during the Second Five Year Plan, is of the order of 1 million tons per year. After meeting the requirements of other users, it is expected that over 900,000 tons of molasses will become available for the manufacture of alcohol from 1959-60 onwards (paras 38, 39, 41 and Table VIII).

4. The total production of alcohol even from all the available molasses as shown in 3 above together with about 1 million gallons produced from Mahua flowers would be of the order of 46.8 million gallons per year (100% by volume). Installed distillery capacity recommended for achieving this production is of the order of 52 million gallons per year. Suitable locations for new and expansion of existing distilleries, in order to achieve the target of production of 46.8 million gallons, are indicated in Table IX. (Paras 41 and 42).

5. The minimum capacity for a distillery of economic size, under the present circumstances in India, is 1 million gallons per year. The Committee recognises, however, that under special circumstances, the economics of production in units of smaller capacities may not be too disadvantageous. (Para 43).

6. The power alcohol industry has been developed to its present stature on the basis of an ex-distillery price of 14 annas per gallon. It is essential that the basic price for alcohol should not be higher than this figure if its use as a raw material for industries is to be developed. The Committee considers this an essential prerequisite for stimulating industrial development based on alcohol and also in view of the absence of many other organic raw materials for development of these important industries within the country. (Para 48).

The Committee recognises that while the basic price for alcohol may be fixed so as to provide a fair return to the producer, the incidence of price to the consumer may be governed by a system of graded taxation depending upon the purpose to which the alcohol is to be put. (Para 46).

7. As Molasses has been and will continue to be the principal raw material for production of alcohol, control over its price and distribution is essential if the price of alcohol is to be maintained at a low level. An ex-sugar factory price of 4 annas per maund, for molasses containing not less than 50 per cent total sugars, is recommended. For molasses of lower sugar content, correspondingly lower prices on the lines prescribed in the U. P., may be charged. (Para 50).

In spite of the many representations demanding an increase in the price of molasses, the Committee is unable to recommend any such increase because, while it will not contribute significantly to reducing the price of sugar to the consumer, such an increase would be detrimental to the development of alcohol and alcohol based industries. (Para 50).

8. In order to ensure uniformity in the control over price and distribution of molasses, it seems preferable that such control should be exercised by the Union Government under powers conferred by the Industries (Development & Regulation) Act. (Para 51).

9. A ceiling price for alcohol has been calculated after taking into account the cost of production in a unit of economic size as well as the actual average transport charges on molasses from sugar factories to the distilleries. It is recommended that a uniform ceiling price for alcohol ex-distillery should be

Rs. 0-12-9 for alcohol of strength 99.5% by volume,

Rs. 0 12-5 for alcohol of strength 96% by volume,

plus an amount corresponding to an additional charge up to a maximum of Rs. 0-6-0 per gallon towards the actual average transport charges incurred on molasses.

The above price would be applicable to alcohol corresponding to the specifications of power alcohol and rectified spirit (industrial grade) respectively. (Paras 52, 53 and 54).

10. In the interest of developing alcohol based industries, it is essential that alcohol of all grades including power alcohol should be charged the same freight rates on Railways. It is recommended that one uniform rate should be charged under Class 10 for Railway Risk and under Class 8 for Owner Risk for all grades of alcohol. (Para 55).

11. There is no unanimity of opinion between the Union and State Governments regarding their respective rights to tax alcohol. The Committee feels, however, that if efforts for promotion of a substantial increase in the consumption of alcohol for industrial purposes are to succeed, it is essential that a uniform taxation policy and procedure should be devised by agreement between the Union and State Governments, as has been done already for power alcohol. Such taxation can be enforced more satisfactorily by the Union Government. (Para 57.)

Two members of the Committee belonging to the State Governments feel however strongly that since Excise duties on alcohol represent a major flexible source of revenue to State Governments, even if it decided that the Union Government alone has the power to levy a duty on industrial alcohol, the collection of such duties should be left to State agencies and the amounts realised retained by the concerned States. (Para 57).

12. It is recognised that for certain categories of uses a higher price of alcohol would not constitute a deterrent to its consumption, and therefore any margin between the ceiling price specified earlier and the higher price which such a user could afford to pay, may provide a source of revenue to Government. Variation in excise duties on alcohol used for different purposes have been recommended in the light of this observation. (Para 59).

13. It is recommended that the incidence of permit or licence fees, vend fees and gallonage charge etc. may be levied, if at all, at a token figure and that such charges should not be levied as a compensation to cover the costs incurred in the administration of Excise and prohibition Laws. (Para 60).

14. It is recommended that Excise Laws governing distillerries engaged in the production of alcohol be revised in consonance with the needs of modern design and practice. The lines on wich existing State Regulations may be revised have been indicated in broad detail. (Para 63.)

15. Control over distribution of industrial alcohol should be exercised under Section 18 (G) of the Industries (Development and Regulation) Act so as to ensure proper correlation between its production and distribution and to guarantee adequate supplies of alcohol at reasonable prices to industries whose development is deserving of encouragement. (Para 66).

16. It is recognised that prevention of misuse of alcohol for potable purposes is the responsibility of State Governments; it is necessary, however, that jurisdiction of State Governments in this respect should be integrated with the need for encouraging industrial developments based on alcohol. The following suggestions have been made to achieve the objective :—

(i) Conditions of licences and permits granted by State Governments to producers or users of alcohol should not conflict with any of the objectives of the Industries ( Development and Regulation ) Act. (Para 68).

(ii) Wide scope should be permitted in the use of special denaturants for alcohol depending upon the specific needs of different industrial processes. (Para 69.)

(iii) While denaturants must be tested and certified as conforming to approved specifications before use, it is not necessery to insist on further tests of the denatured spirit before issue from distilleries. (Para 70).

(iv) A permit for each individual consignment drawn by the licencee need not be insisted upon, so long as supplies are made within an annual quota previously fixed and licensed for use by an industrial user and the consignment is moved each time only against passes from the Excise Inspector stationed at the distillery. (Para 71).

17. The general public may be allowed to buy and keep up to a maximum limit of half a gallon of completely denatured spirit without permit or licence for domestic and other miscellaneous uses. (Para 78).

18. The varying pattern which may have to be developed with respect to mixing depots for supplying petrol mixed with power alcohol in different parts of the country during the next few years has been indicated. (Para 76 and Table XII).

To ensure the offtake of power alcohol in different areas from year to year it is considered necessary to adopt a flexible system for the sale of power alcohol, under which the Oil Companies should take over directly from the distilleries the stipulated amount of alcohol allotted to them each year and take charge of arrangements for the purchase, handling, transport and sale of all power alcohol. An outline of the arrangements that should be made for this purpose has been indicated. (Paras 78 and 79).

19. The need is felt to have a clear definition of the terms "alcohol" and "spirit" so as to devise methods for extending facilities and assistance exclusively to producers and users of power and industrial alcohol. It is suggested, therefore, that the term "alcohol" be used for denoting only ethyl alcohol of 66° over proof and above, and the term "spirit" be limited exclusively for alcohol of lower grades. (Para 80).

20. Recently, the Ministry of Finance have issued a Notification exempting methyl alcohol from the purview of the definition of the term "spirit", for purposes of levy of Customs Duty. The Committee recommends that a similar notification exempting higher alcohols such as isopropyl, amyl, butyl, etc., which are neither potable nor intoxicants be issued immediately and that the scope of control and taxation of all alcohol or spirit be confined scrupulously to ethyl alcohol only.

A similar exemption from control applicable to ethyl alcohol should be granted also to users of fusel oil containing less then 12 proof gallons of ethyl alcohol. (para 81).

21. The cost of excise supervision should not be realised from distilleries, as it constitutes an appreciable addition to the cost of production of alcohol. (para 82).

22. Sometimes difficulties arise because of dual control over alcohol producers exercised by the Union and State Government Departments. It is recommended that a system may be devised under which one single officer, either of the Union or the State Government concerned, will be in sole charge of a distillery or a factory. (Page 83).

23. The anticipated movements of molasses and alcohol for the Second Five Year Plan period have been worked out for the guidance of Railway Authorities. The Committee wishes to stress that provision of tank wagons in adequate numbers for both is essential to ensure success of the programme of development of alcohol based industries and therefore expenditure on tank wagons should be regarded as a developmental item and arrangements made to procure them in adequate numbers in anticipation of the need. (Para 85).

24. It may be possible to build up an export market for over a few million gallons of alcohol per year if the price of alcohol is pegged at the level recommended in this report. Suitable assistance should be given with regard to excise procedure and availability of tank wagons and storage facilities at ports to prospective exporters. (Para 86).

25. A Development Council for Fermentation Industries including alcohol and products obtained therefrom should be constituted as early as possible. (Para 87).

26. Since State Governments issue permits or licences to all consumers of alcohol, they should maintain detailed statistics relating to industrywise consumption of alcohol, because such data would be valuable for estimating the requirements of industries in future. (Para 88).

## Acknowledgment

The committee wishes to place on record its appreciation of the valuable assistance given to it by the Member-Secretary, Mr. S. L. Venkiteswaran.

Signed :—

A. Nagaraja Rao
8-12-1956
*Chairman.*

G. P. Kane
8-12-1956
*Alternate Chairman*

W. Saldanha
8-12-1956
*Member*

Jasjit Singh
8-12-1956
*Member*

Shri Pat
8-12-1956
*Member*

S. L. Venkiteswaran
8-12-1956
*Member Secretary.*

# APPENDIX I

Government of India
Ministry of Commerce & Industry.

## RESOLUTION

New Delhi, dated the 11th October, 1955. No. Ch. Ind. 33 (11)/52. The present production of alcohol in the country is being largely utilised as power alcohol which in admixture with petrol is used as an automobile fuel. Quite apart from the fact that the scope for using alcohol in this fashion is for various reasons very limited, it is desirable that the many industrial uses of alcohol should be developed so that many products for which the country is dependent on imports today and the demand for which is going up could be produced in India. With the expansion which is taking place and is expected to take place in the production of sugar, the potentiality for producing alcohol is on the increase. Taking all these circumstances into account, the Government of India have decided to appoint a Committee consisting of the following members :—

Dr. A. Nagaraja Rao, Chief Industrial Adviser to the Government of India, Ministry of Commerce & Industry—*Chairman.*

[Dr. G P. Kane, Industrial Adviser to the Government of India, Ministry of Commerce & Industry, will be the alternate Chairman in the absence of Dr A Nagaraja Rao.]

**Members.**

1. Shri M. P. Alexander, Under Secretary, Ministry of Finance (R. D.).
2. Shri Jasjit Singh, I. A. S., Director of Prohibition & Excise, Government of Bombay.
3. Sri Shri Pat, I. A. S., State Director of Industries, Kanpur (U. P.).
4. Shri S. L. Venkiteswaran, Deputy Development Officer (Power Alcohol) Development Wing, Ministry of Comerce & Industry.

Shri S. L. Venkiteswaran, Deputy Development Officer, Ministry of Commerce & Industry, Development Wing, will be the Member-Secretary of the Committee.

The following will be the terms of referance to the Committee :—

1. To assess the scope for increasing the production of alcohol in the country having regard to the present and potential availability of the raw materials and to suggest suitable locations for any new units for producing alcohol that may need to be set up.
2. To examine the manner in which the total alcohol production in the country can be fully utilised either as power alcohol or more particularly for industrial purposes and to recommend the industries which can be expanded or established having regard to the increase in the availability of alcohol for industrial purposes in the country.

3. To study the system of control exercised by different States over the production, distribution and transport of alcohol and to make suitable recommendations for their simplification where necessary in order to ensure that while the objectives of the control are adequately safeguerded, the industrial concerns which need alcohol as a raw material have the minimum of difficulty in meeting their requirements.

4. To make any other recommendations that the Committee may deem appropriate having regard to the objectives of increasing the production and utilisation of alcohol for industrial purposes.

The Committee will have the power to co-opt members, official and non-official, as and when necessary and in particular it will ensure that a representative of the State Government concerned is associated in its studies of the system of control exercised in each State.

The Committee will submit its report to the Ministry of Commerce & Industry within six months of the date of its appointment.

The Committee will function in the Development Wing, Ministry of Commerce & Industry, New Delhi

## ORDER

Ordered that a copy of the Resolution be communicated to all concerned and that it be published in the Gazette of India Extra-Ordinary.

(B. B. Saksena)
Joint Secretary to the Govt.
of India.

## APPENDIX II

### A. QUESTIONNAIRE FOR DIRECTORS OF INDUSTRIES OF STATE GOVERNMENT.

1. What is the total annual production in your State, during each of the last two years, of

   (a) Absolute alcohol.

   (b) Rectified Spirit.

   (c) Denatured Spirit.

2. What it the present demand in your State for,

   (a) Absolute Alcohol.

   (b) Rectified Spirit.

   (c) Denatured Spirit.

3. What are the various alcohol consuming industries in your State ? Please supply the following particulars for such of the items for the manufacture of which alcohol is used.

   (i) Installed capacity for the production of each item.

   (ii) Actual production during each of the last two years.

   (iii) Total quantity of alcohol used during each of the last three years.

   (iv) Anticipated demand for alcohol for the next two years.

If different types of alcohol-absolute alcohol, rectified spirit, denatured spirit—are required, please indicate the quantities of each variety separately.

4. Are there any difficulties experienced by the alcohol consuming industries in your State, regarding :

   (i) Alcohol supplies (transport difficulties, high prices, etc.).

   (ii) Statutary restrictions such as excise rules and regulations, sales acts, etc. regarding supplies of alcohol and other raw material requirements as also distribution and sales of their finished products.

5. What are the raw materials used by the various distilleries in your State for the manufacture of alcohol ? The nature and sources of supply of the raw materials used by each distillery may be indicated. The approximate total annual requirements of such raw materials of all the existing distilleries in your State at the present time may be specified. An estimate of the availability of additional quantities of raw materials for expansion of the production capacity of alcohol, either in the existing distilleries, or in new distilleries to come up in your State may also be indicated.

6. Are the raw material resources and other facilities in your State adequate to step up the production of alcohol, either by expanding the existing distilleries or by setting up new distilleries ? What is the maximum possible increase in annual production of alcohol with the available facilities.

7. What is the scope for expanding the production capacity of the existing alcohol consuming industries in your State ?

8. In addition to the above information, you may also mention any other factors which in your opinion, will facilitate rapid and rational development of your alcohol producing and consuming industries.

*Note* :—Wherever the word 'year' occurs in this questionnaire the reference is to the financial year—1st April to 31st March.

## B. QUESTIONNAIRE FOR EXCISE COMMISSIONERS OF STATE GOVERNMENTS.

1. Please supply a complete list of all the distilleries in your State with their full names and addresses, and their daily production capacity. Production of each particular grade of alcohol—absolute alcohol, power alcohol, rectified spirit, denatured spirit, potable spirits, etc., at each of these distilleries, for the last two years, may be given in both bulk and proof gallons ?

2. What are the various kinds of licences for manufacture, storage, distribution, sales, use, etc. of alcohol, issued by your department under the Central and State Excise Acts and the Indian Power Alcohol Act.

2A. What is the total quantity of alcohol of each variety, i.e., absolute alcohol, rectified spirit, dentured spirit, potable spirits, consumed in your State during the last two years ?

3. Is the entire production—or the major part of alcohol manufactured in your State—utilised within the State ? If so, indicate the purposes for which it is used.

4. Is there any price control enforced by your State Government on alcohol manufactured in any of your distilleries ? If so, please give details of the price control policy, and the actual controlled prices for the last two years.

5. What are the current ruling prices of the various grades of alcohol ? Have there been any substantial variations in the price of alcohol in your State during the last two years ?

6. What is the quantum of excise duty, pass fee, vend fee, gallonage fee, etc., charged on various qualities of alcohol in your State ? What are the rates at which excise duties are levied on preparations (Medicinal, toilet, etc.) containing alcohol ? Do they differ substantially from the rates prevailing in the neighbouring States ?

7. What is the total annual revenue derived by your State from excise duties and from other fees, such as gallonage, vend fee, pass fee, etc., levied on various kinds of alcohol and spirituous preparations manufactured or sold in your State ? What percentage of your total revenue is accounted for by these excise duties on alcohols and spirituous preparations ?

8. Are excise duties levied only on ethyl alcohol and its compositions or on all alcohols ? Is there any procedure that permits industries to use non-potable alcohols without excise controls ?

9. Are there any industries in your State which are granted exemption from the payment of duty on alcohol ? What is the proportion of alcohol

supplies to such industries expressed as a percentage of the total alcohol production in your State ?

10. There have been several representations from alcohol consuming industries that variations in the existing excise Rules and Regulations from State to State create some difficulties for them in connection with their business activities. It has been suggested that it is necessary to rationalise these Rules and Regulations on a common basis which is uniformly applicable to all the States. Please let us know your views on the subject.

11. In addition to the above information, you may also mention any other factors which in your opinion, will facilitate rapid and rational development of your alcohol producing and consuming industries.

*Note* :—Wherever the word 'year' occurs in this questionnaire, the reference is to the financial year—1st April to 31st March.)

## C. QUESTIONNAIRE FOR PRODUCERS.

### I. Statistics of Production.

(1) What are the different varieties of alcohol manufactured by your firm-power alcohol, rectified spirit, denatured spirit, potable spirits ?

(2) What is your present installed plant capacity for the manufacture of different varieties of alcohol ? Please give both the daily and annual capacities.

(3) What was your actual production, of each variety of alcohol, for the last two years ?

(4) What is the average number of working days in a year during which your plant is in operation ?

### II. Raw Material Supplies.

(1) What is the raw material/materials used for the manufacture of alcohol at your works ?

(2) Wherefrom do you obtain your supplies of raw materials ? If you obtain supplies from more than one source, indicate the quantity obtained from each.

(2) What is the average price paid by you, ex your works, for these raw materials ?

If transport of the raw materials involves haulage over considerable distances, from the source of supply to your works, please specify the method of transport—by rail, by motor lorries, etc.,—and also mention the transport charges. Please state the average transport charges, per maund of raw material, during the last two years.

(4) Are the raw materials supplied to you of a uniform quality, throughout the year ; or, are there any seasonal or other fluctuations in the quality ?

(5) What is the type of storage provided for the raw materials at your works, and what is the total storage capacity available ?

(6) Have you any specific difficulties in regard to your raw material requirements ?

(7) Besides the principal raw materials, such as molasses, mahua flowers, etc., what are your arrangements for obtaining other materials, such as yeast and benzene ?

## III. Plant and Process.

(1) Please give a brief description of the type and size of the various plant units, and details of the process employed at your works.

(2) If the entire plant—or a substantial part of it—has been designed or supplies by one or more foreign firms, please specify the names of those firms.

(3) When was your plant installed and when did you start production ?

If it has not been operating at or near its full rated capacity for any considerable length of time, from the date of its installation until now, please indicate the reasons.

(4) What was the original capital investment on plant and machinery including the erection charges, and what is its present written-down value ?

(5) What was the original capital investment on buildings and what is the present written-down value ?

Please give separate figures for factory buildings and residential colony, if you have provided any.

(6) Did you have any occasion in the past to replace any substantial part of your original plant or equipment, or is there any need for such a replacement either now or in the near future ? You may please mention the reasons for such replacements.

## IV. Costs of production.

(1) Please indicate your average cost of production in the form given below for each of the last two years i.e. 52-53 and 53-54 :—

| | *Qty.* | *Rate per unit* | *Total cost* |
|---|---|---|---|
| Raw materials (each item to be separately given). | | | |
| Other materials (Yeast, Benzene, etc.) | | | |
| Water | | | |
| Steam (if obtained from sources other than your own generating station). | | | |
| Fuel (Coal, Oil etc.) | | | |
| Power | | | |
| Labour wages<br>Supervisory staff. | | | |

Depreciation on :

(i) Plant and machinery

(ii) Buildings.

Interest on working capital, etc.)

Other overheads (administrative office etc.)

Total cost of production.

## V. Alcohol sales.

(1) Industry-wise, who are your major customers, i.e., whose aggregate off-take accounts for more than 85% of your total production ? The proportion of your total production sold to each of the following industries may be mentioned separately :—

(a) Oil companies (power alcohol for admixture with petrol).

(b) Pharmaceutical concerns.

(c) Other industries.

(d) Denatured spirit for domestic use.

(2) What is your ex-works selling price for each variety of alcohol manufatured by you ?

If the selling price for part—or whole—of your production is controlled, as in the case of power alcohol, what is the price which you actually realise on such controlled sales ? And for the same product, what is the price which you realise from sales on which no such control is imposed ?

(3) What is the approximate percentage of each variety of your alcohol production sold within the State in which your distillery is located and what are the other States to which you export substantial quantities of alcohol ?

(4) What are the respective percentages of the quantities transported by you :—

(a) in tank cars by rail,

(b) in tank cars by motor lorry,

(c) in smaller packings like 40 gallon and 5 gallon drums to your various cutomers ?

(5) Do you have any serious transport difficulties, such as inadequate tank car facilities etc. ?

(6) Is the demand for your products evenly spread over the whole year ; or are there any seasonal variations ?

## VI. Excise policy and control :

(1) What is the strength of the Government Staff, Central and State, posted at your works for excise supervision and control ? What is the average amount paid by you to the Government towards the cost

of maintaining this excise establishment at your works? If no amount is paid in cash but certain amenities are provided such as provision of residential accommodation, etc. the average expenditure per year incurred for this purpose may be stated.

(2) What is the storage capacity of your bonded warehouse or warehouses?

The number and capacity of the individual storage tanks with the particular quality of alcohol stored in that may be mentioned.

(3) What are the various stages of manufacture and sales at which excise control is exercised? The relevant rules of the State excise department may be quoted wherever necessary.

(4) What are the difficulties, if any, which you are experiencing as a result of the variations in the excise policies of the State in which your distillery is located and the other States to which some or most of your production is exported?

## VII. General information about the Company.

(1) Is your firm registered under the Companies Act? Is it a Public limited company, private limited company or a partnership? Is your company also registered under the Industries (Development & Regulation) Act?

(2) What is the capital structure of your firm? Amount of paid up capital, debentures, etc., may be mentioned.

(3) Is your distillery an entirely separate organisation by itself, or is it only a department of larger organisation such as a sugar factory?

(4) What is the approximate number of persons engaged by your distillery in the various categories of skilled, semi-skilled, un-skilled and supervisory staff? What is the approximate average wage paid to each of these categories of employees?

How many of your staff are holders of:—

(a) Degrees.

(b) Diplomas in:—

(1) Science.
(2) Engineering.
(3) Technology.
(4) Other subjects.

(5) What is your total sales turnover for each of the last years?

(6) What is the total annual amount of excise duty paid to the Government by your firm?

(7) What are the annual dividends, if any, paid to your shareholders for the last two years? Has any bonus been paid to your staff and workers for the last two years?

(8) Have you any expansion schemes to increase the production capacity of your plant? Are your sources of raw material supplies and other resources adequate to take up schemes for expanding your production

substantially if there is sufficient demand for increased production of alcohol? Please indicate the maximum extent to which it will be possible for you to undertake increased production of alcohol at your works.

(8) In addition to the above information, you are requested to mention any other problems relating to your industry to which you wish to draw the specific attention of the Government with a view to initiate whatever action may be necessary to ensure a proper and rapid development of the alcohol industry in this country.

Note:—Whatever word 'year' occurs in this questionnaire, the reference is to the financial year from 1st April to 31st March.

## D. QUESTIONNAIRE FOR USERS OF ALCOHOL.

(1) What are the various products for the manufacture of which you require alcohol at your works?
Please mention the plant capacities for each of those products and also the annual production for the last two years.

(2) Do you need power alcohol, rectified spirit or denatured spirit for your work? What was your annual alcohol consumption for the last two years? What is the anticipated demand for alcohol at your works during the next two years? If the latter figure is substantially more than your present consumption of alcohol, please indicate the reasons for the increased demand anticipated for the next two years.

(3) If denatured spirit is required for your purposes, is there any need for the use of special denaturants--such as acetaldehyde or the usual denaturants like pyridine will suffice?

(4) What is the average price, ex your works, for alcohol supplies during the last two years?

(5) If you require very large quantities of alcohol, and if your works are situated at a considerable distance from any established alcohol distillery, please give the reasons for the location of your factory at its present site, instead of any other site nearer to a source of supply of alcohol?

(6) What is the incidence of the cost of alcohol on the cost of production of each of your products in the manufacture of which alcohol is used, at the current prices for the various raw materials, services and labour wages?

(7) If the Government is maintaining any excise establishment at your works, please give the strength of the Government staff employed and annual payment made by you towards the cost of the establishment.

(8) What are the various excise measures to which your production and sales are subject? Relevant rules of the state excise departments, in support of the control exercised, may be quoted.

(9) What is the percentage of your total production sold in the State in which your works are located and what are the other States to which your products are exported in substantial quantities?

(10) What are the difficulties which you are facing because of any existing variations in the excise rules and regulations, and other legislations prevailng in your State and the States to which your produces are exported? What, in your opinion, are the steps to be taken to overcome these difficulties?

(11) Do you get your alcohol duty free? If duty or any other fee is paid please indicate the incidence of the duty or such fee on the total cost of each product in the manufacture of which alcohol is used.

(12) Have you any plans for expansion of your production capacity?

If there are any such plans, what will be your additional demand for alcohol?

Is the position regarding plans for further expansion dependants, to any extent, on the availability of alcohol at a cheaper price and or any other measures relating to alcohol supplies?

(13) Is your company registered under the Companies Act? Is it a public limited company, private limited company, or a private partnership? Is your company also registered under the Industries (Development & Regulation) Act?

(14) What is your total capital investment on plant and machinery, factory buildings, and residential colony? Please give separate figures for each of the items.

(15) When did your factory start production? If production at any particular period was much less than the rated capacity, please indicate the reasons.

(16) What is the total number of persons employed in your factory in the various categories of skilled, unskilled and supervisory staff?

(17) In addition to the above information, you are requested to mention any other issues to which you wish to draw the specific attention of the Government with a view to expand the scope for the manufacture and utilisation of industrial alcohol in this country.

(Note:—Wherever the word 'year' occurs in this questionnaire the reference is to the financial year-1st April to 31st March )

## E. QUESTIONNAIRE FOR PETROLEUM COMPANIES.

(1) What was the total quantity of Power Alcohol used for admixture with petrol by your company during each of the last three years?

(2) What are the particular States in which you have been selling power alcohol petrol blends, for use as motor spirit? What is the quantity of the Blend sold in each of the States in each of the last three years? What is the total quantity of neat petrol sold as much, in each of the States, during each of the last three years? What are the average prices at which motor spirit, either petrol or power alcohol petrol-blends, sold by your company, in each of the States, during each of the last three years?

(3) What is the total quantity of petrol sold by your company, in the form neat petrol or power alcohol petrol blend, in the whole of the country during each of the last three years? What was your average selling price for motor spirit at port towns in each of the last three years?

(4) Have you any difficulties with regard to the supplies of power alcohol and the storage, distribution and sales of power alcohol-petrol blends?

(5) Please indicate the various stages in the preparation, storage and sales of power alcohol-petrol blends where excise control and supervision is exercised. Does the enforcement of excise rules and regulations give rise to any special problems or difficulties in the manufactur and sale of power alcohol petrol blends as motor spirits in this country? If there are any such difficulties, what are the changes which you propose in the State and central Excise Acts or Rules to overcome these difficalties?

(6) What, in your opinion, are the various factors which come in the way of using much larger quantities of power alcohol, than at present, to meet the motor spirit requirements of the country? What are the various measures which, in your opinion, are necessary to substantially increase such use of power alcohol in this country?

(7) If, in addition to power alcohol, you use any other grades such as rectified spirit; denatured spirit, etc., for any other purposes, please give an indication of the total quantities of each of the different varieties of alcohol and the purposes for which they are used.

(8) In addition to the above information, you may also mention any other issues to which you wish to draw the specific attention of the Government with a view to expand the scope for the manufacture and utilisation of power and industrial alcohol in this country.

(Note:—Wherever the word 'year' occurs in this questionnaire, the reference is to the financial year—1st April to 31st March.)

## APPENDIX III

### A. List of Persons Associated in the Committoe's work at different stages.

| | | |
|---|---|---|
| 1. | Shri K. P. Sen I. A. S. | Commissioner of Excise, West Bengal, Calcutta. |
| 2. | ,, H. P. Kanth, I. A. S. | Commissioner of Excise, Behar, Patna. |
| 3. | ,, A. Mazumdar. | Director of Industries, Behar, Patna. |
| 4. | ,, Kehar Singh I. A. S | Excise Commissioner, U. P., Allahabad |
| 5. | ,, S. S. Sharma. | Asstt. Excise Commissioner U. P., Allahabad. (To assist Sri Sri Pat.) |
| 6. | ,, T. N. S, Raghavan I. C. S. | Member Board of Revenue, Madras. |
| 7. | ,, V. Shankar I. C. S. | Secretary, Revenue Deptt. Government of Bombay. |
| 8. | ,, Rajeswar Rao I. A. S. | Excise Commissioner, Hyderabad. |
| 9. | ,, Narainswamy. | P. A. to excise Commissioner, Mysore, Bangalore. |
| 10. | ,, S. N. Gundu Rao. | Director, Indian Institute of Sugar Technology, Kanpur. |

### Other Representatives of State Governments who were consulted.

| | | |
|---|---|---|
| 11. | Shri D. D. Kapila I. A. S. | Excise Commissioner, Delhi. |
| 12. | ,, J. S Basur I A. S. | Excise Commissioner, Punjab. |
| 13. | ,, Hans Raj | Secretary, Industries, Delhi. |
| 14. | ,, M. P. Ray. | P. A. to Ex. Com., Bihar. |
| 15. | ,, R. S. Misra. | Secretary, Revenue Deptt. Bihar. |
| 16. | ,, Raghvendra Prasad I. A. S. | Excise Commissioner, Vindhya Pradesh. |
| 17. | ,, Dr. S. T. Merain, I. A. S. | Secretary, Industries, Orissa. |
| 18. | ,, G. D. Goswami I. A. S. | Deputy Secretary, Excise, West Bengal, |
| 19. | ,, M. P. Sen. | Commissioner of Excise, West Bengal. |
| 20. | ,, J. N. Chaudhuri. | Special Superintendent of Excise, West Bengal. |
| 21. | ,, Prit Mohinder Singh. | Excise Commissioner, Pepsu. |

### B. List of persons (Non Official) Interviewed.

| | | |
|---|---|---|
| 22. | Shri C. E. J. Crawford. | Alkali & Chemical Corporation India Ltd., Calcutta. |
| 23. | ,, A. M. Cameron. | ,, ,, ,, |
| 24. | ,, A. T. Thompson. | APV Engineering Co. Ltd., Calcutta. |
| 25. | ,, S. V. Sovakar. | SKG Distillery, Hathua, Behar. |
| 26. | ,, E. M. Parthasarathy. | Behar Sugar Works, Pachhrukhi, Behar. |
| 27. | ,, Ramesh Chandra. | New Swadeshi Sugar Mills, Narkatia-Ganj, Behar. |

| | | | |
|---|---|---|---|
| 28. | ,, | A. K. Mukherjee. | Russa Distillery, Tollygunj, Calcutta. |
| 29. | ,, | P. K. Sen. | Carew & Co. Ltd., Asansol. |
| 30. | ,, | D. Hayward. | Begal Distillery Co. Bhadravati. |
| 31. | ,, | Galloway. | National Carbon Co. Calcutta & Bombay. |
| 32. | ,, | Dadachanji. | ,, ,, ,, |
| 33. | ,, | Dr. R M. Thakkar. | ,, ,, ,, |
| 34. | ,, | Sri B. Karim. | Shellac Industries Ltd., Calcutta. |
| 35. | ,, | Sri M. L. Gupta. | Shellac Industries Ltd., Calcutta. |
| 36. | ,, | D. S. Majithia. | All India Distillers, Association, New Delhi. |
| 37. | ,, | N. K. Bali. | ,, ,, ,, |
| 38. | ,, | M. L. Chatrapati. | ,, ,, ,, |
| 39. | ,, | Anand Singh. | ,, ,, ,, |
| 40. | ,, | Benarasi Lal. | ,, ,, ,, |
| 41. | ,, | O. N. Chandoke. | ,, ,, ,, |
| 42. | ,, | T. M. Desai. | Walchandnagar Industries, Walchandnagar. |
| 43. | ,, | C. Subramanium. | ,, ,, ,, |
| 44. | ,, | K. R. Shitale. | ,, ,, ,, |
| 45. | ,, | S. P. Limaye. | Maharashtra Sugar Mills Ltd., Tilaknagar. |
| 46. | ,, | D. S. Amin. | Alembic Chemical Works Ltd. Baroda. |
| 47. | ,, | D. R. Shroff. | Shroff & Co. Bombay. |
| 48. | ,, | Dr. D. M. Trivedi | Polychem Ltd., Bombay. |
| 49. | ,, | Govindakrishnayya. | M/S. Burmah Shell Ltd. |
| 50. | ,, | K. Singh. | ,, ,, ,, |
| 51. | ,, | Shri J. E. Girfil. | Caltex (India) Ltd., |
| 52. | ,, | Pawan Das. | ,, ,, |
| 53. | ,, | H. C. Gozdar. | Standard Vacuum Oil Co. Ltd. |
| 54. | ,, | S. S. Gambhir. | ,, ,, ,, |
| 55. | ,, | Dr. K. A. Hamied. | Indian Chemical Manufacturers Association. |
| 56. | ,, | Dr. M. D. Parekh | ,, ,, ,, |
| 57. | ,, | K. S. Amin. | ,, ,, ,, |
| 58. | ,, | G. P. Nair. | ,, ,, ,, |
| 59. | ,, | Ghuvalewala. | ,, ,, ,, |
| 60. | ,, | R. G. Pradhan. | Govt. Alcohol Factory & Nizam Sugar Works, Shakarnagar, Hyderabad. |
| 61. | ,, | Dr. R. S. J. Rao. | Superintendent Govt. Central Distillery, Nasik Road. |
| 62. | ,, | J. S. Prabhu. | Parry & Co. Ltd., Madras. |
| 63. | ,, | B. G. Krishnamurthi. | ,, ,, ,, |
| 64. | ,, | N. Venkatayya. | KCP Ltd , Vuyyuru. |
| 65. | ,, | B. Venkata Rao. | Mysore Minerals & Gas. Co., Mandya. |
| 66. | ,, | I. S. Dasegowda. | Mysore Sugar Co. Ltd., Mandya. |
| 67. | ,, | G. Karasinh Iyengar. | ,, ,, ,, |

## APPENDIX IV.

**List of distilleries in operation as on April 1956, and newly licensed up to 30-11-56 A. Distilleries in operation with their capacities**

| S. No. | Name of Distillery | Location | Capacity Gls/Month<br>Power Alcohol | Industrial Alcohol |
|---|---|---|---|---|
| **Uttar Pradesh.** | | | | |
| 1. | Central Distillery & Chemical Works, Ltd. | Meerut | 45,000 | 10,000 |
| 2. | Daurala Sugar Works | Daurala | 75,000 | 7,500 |
| 3. | The Ajudhia Distillery | Rajaka Sahaspur | 50,000 | 5,000 |
| 4. | The Simbhaoli Industries Ltd. | Simbhaoli | 57,500 | 5,000 |
| 5. | The Upper Doab Sugar Mills Ltd. | Shamli | 50,000 | 5,000 |
| 6. | The Narang Industries Ltd. | Nawabganj | 50,000 | 5,000 |
| 7. | The Shankar Distillery & Chemical Works Ltd. | Captainganj | 117,500 | 17,500 |
| 8. | The Oudh Sugar Mills (Distillery) | Hargaon | 75,000 | 8,333 |
| 9. | The Hindustan Sugar Mills, Ltd. | Golagokaran nath | 82,500 | 3,750 |
| 10. | The Kesar Sugar Works Ltd. | Baheri | 75,000 | 2,500 |
| 11. | The Rampur Distillery & Chem. Works Ltd. | Rampur | 30,000 | 32,000 |
| 12. | Saraya Distillery | Sardarnagar | 150,000 | 6,250 |
| **Bihar** | | | | |
| 13. | The S. K. G. Distillery, Hathua P. O. Mirganj (Dist. Saran) | Hathua | 70,000 | 9,000 |
| 14. | The Behar Sugar Works, Dist. Saran | Pachrukhi | 37,500 | 9,000 |
| **Bombay** | | | | |
| 15. | Govt. Central Distillery | Nasik Road | 66,000 | 30,000 |
| 16. | The Kolhapur Sugar Mills | Kolhapur | 25,000 | 15,000 |
| **Hyderabad** | | | | |
| 17. | The Hyderabad Govt. Power Alcohol factory | Shakarnagar Nizamabad | 85,000 | 5,000 |
| **Mysore** | | | | |
| 18. | The Mysore Sugar Co. Ltd. | Mandya | 45,000 | 45,000 |
| **Pepsu** | | | | |
| 19. | The Jagatjit Dis. & Allied Industries Ltd. | Jagatjitnagar (Kapurthala) | 66,000 | 16,700 |

## Industrial Alcohol only

| S. No. | Name of the Unit | Location | Ind. Alcohol |
|---|---|---|---|
| **Uttar Pradesh** | | | |
| 1. | Standard Refinery & Dist. Ltd. | Unnao | 37,500 |
| 2. | Carew & Company Ltd. | Rosa | 37,500 |
| 3. | Dyer Meakin Breweries Ltd. | Lucknow | 30,000 |
| 4. | Cooperative Company | Saharanpur | 15,000 |
| **Bihar** | | | |
| 5. | Sultanganj Distillery | Sultanganj | 33,000 |
| 6. | Cawnpore Sugar Works Ltd. (Dt. Saran) | Marhowrah | 27,000 |
| 7. | Ranchi Distillery | Ranchi | 31,500 |
| **Bombay** | | | |
| 8. | Walchandnagar Industries Ltd. | Walchandnagar | 60,000 |
| 9. | Alembic Chemical Works | Baroda | 15,600 |
| 10. | Maharashtra Sugar Mills (Dt. Ahmednagar) | Tilaknagar | 45,000 |
| **Bengal** | | | |
| 11. | The Bengal Distilleries Co Ltd. | Bhadrakali | 18,000 |
| 12. | Carew & Company Ltd. | Asansol | 62,000 |
| 13 | Russa Distillery | Tollyganj | 45,000 |
| **Mysore** | | | |
| 14. | India Sugar & Refineries Ltd. | Hospet | 25,000 |
| **Andhra** | | | |
| 15. | Vizagapatam Sugars & Refineries Ltd. | Thummapala | 12,000 |
| 16. | K. C. P. Ltd. | Vuyyuru | 50,000 |
| 17. | Deccan Sugar & Abkari Co. Ltd. | Samalkot | 40,000 |
| **Madras** | | | |
| 18. | East India Distilleries & Sugar Fact. Ltd. | Nellikuppam | 83,000 |
| **Travancore Cochin.** | | | |
| 19. | The Travancore Sugars & Chem. Ltd. | Tiruvalla | 15,000 |
| 20. | Paul Perincherry | Chalakudi | 15.000 |
| **Punjab** | | | |
| 21. | The Punjab Distilling Industries Ltd. | Khasa | 60,000 |
| 22. | The Karnal Distillery Co. Ltd. | Karnal | 18,000 |
| **Rajasthan** | | | |
| 23. | Govt. Sugar Factory. | Sriganganagar | 15,600 |
| **Hyderabad** | | | |
| 24. | Govt. Distillery. | Kamareddy | 37,500 |
| **Vindhya Pradesh** | | | |
| 25. | Cox Distillery | Nowgong | 20,000 |
| **Bhopal** | | | |
| 26. | Central India Chemicals. | Sehore | 15,000 |

### Country Spirit

| | | | |
|---|---|---|---|
| 1. | Seoni Distillery | (Seoni)<br>(Madhya Pradesh) | Combined capacity roughly equivalent to 1.6 million gallons of 100% Alcohol. |
| 2. | R.J.Contractor & Co. | Barwaha/Ujjain<br>(Madhya Bharat) | |
| 3. | Bhiwandiwala & Co. | Bhopal<br>(Bhopal) | |
| 4. | Mankatha Distillery, (Dt. Mongyr) | Mankatha<br>(Dt. Mongyr) | |
| 5. | Jeypore Sugar Co. Ltd. | Rayagada<br>(Orissa State) | |
| 6. | Govt. Distillery. | Narayanguda<br>(Hyderabad) | |

| | | Gallons. |
|---|---|---|
| Total annual capacity | Power Alcohol :— | 14,914,000 |
| ,, ,, ,, | Industial Alcohol | 12,864,000 |
| ,, ,, ,, | Law strength Alcohol | 1,600,000 |
| | Total. | 29,388,000 |

**Or 29.4 million galloens.**

**B. Units Idle or closed down recently.**

| | | | |
|---|---|---|---|
| 1. | Kanpur Sugar Works Distillery, Kanpur. | 37,500 | |
| 2. | Indian Distillery, Kanpur. | 15,000 | |
| 3. | Godavari Sugar Mills, Sakarwadi. | 40,000 | |
| 4. | Krishna Sugar Mills, Krishnakittur. | 15,000 | |
| 5. | Brihan Maharashtra Sugar Syndicate, P. O. Shreepur. | 15,000 | |
| 6. | Outh Sugar Mills Distillery, Hargaon, U. P. | 40,000 | [part capacity] |

## Appendix IV (contd ) C. LICENCES FOR EXPANSION OR NEW UNITS GRANTED SO FAR.

| Name of the firm | Nature of scheme | Present annual capacity | Annual capacity when the scheme is completed | Remarks |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| Central Distillery and Chemical Works Ltd., Meerut U.P. | Expansion ... | (i) 540,000 gallons of power alcohol<br>(ii) 120,000 gallons of industrial alcohol. | (i) 1,320,000 gallons of total alcohol. | May be completed in 1957. |
| M/s. Upper Doab Sugar Mills Ltd. U.P. | Expansion and shifting from Shamli to Pilkhani. | (i) 600,000 gallons of power alcohol<br>(ii) 60,000 gallons of industrial alcohol. | (i) 1,000,000 gallons of total alcohol. | Do. |
| Shri Rama Sugars & Industries Ltd. Bobbili Madras. | New Unit ... | ... | 300,000 gallons of rectified and denatured spirit. | Completed recently. Not yet in production. |
| New Swadeshi Sugar Mills, Narkatiagunj. | New Unit ... | ... | 960,000 gallons of power and industrial alcohol. | May be completad in 1958. |
| M/s. Narang Industries Ltd. Nawabgunj U.P. | Expansion ... | (i) 600,000 gallons of power alcohol<br>(ii) 60,000 gallons of industrial alcohol. | (i) 1,080,000 gallons of power alcohol<br>(ii) 240,000 gallons of industrial alcohol. | Completed recently, but not in full production. |
| M/s. Shadilal Sugar & General Mills Ltd. | Expansion ... | — | 720,000 gollons of power alcohol. | May be completed in 1958. |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Ajudhia Distillery U.P. | Expansion ... | (i) 600,000 gallons of power alcohol<br>(ii) 60,000 gallons of weaker spirit. | (i) 960,000 gallons of power alcohol<br>(ii) 240,000 gallons of weaker spirit. | Do. |
| M/s. Govan Bros., Rampur U.P. | Expansion ... | 750,000 gallons total alcohol. | 900,000 gallons total alcohol. | May be completed in 1958. |
| M/s. Vizagapatam Sugar & Refinery Ltd. Andhra. | Expansion ... | 144,000 gallons of industrial alcohol. | 600,000 gallons of industrial alcohol. | Do. |
| Maharashtra Sugar Mills Ltd. Bombay. | Already in existence - brought under the purview of the Act. | ... | 540,000 gallons of industrial alcohol. | ... |
| M/s. Mysore Sugar Co. Ltd. Bangalore. | Expansion ... | (i) 540,000 gallons of power alcohol.<br>or<br>(ii) 540,000 gallons of industrial alcohol. | (i) 1,200,000 gallons total alcohol. | ... |
| Upper Ganges Sugar Mills Seohara. | New Unit ... | ... | 1,320,000 gallons of Power & Industrial alcohol. | May be completed in 1958. |
| Daurala Sugar Works Ltd. Distillery Daurala. | Expansion ... | 1,000,000 gallons of Power & Industrial Alcohol. | 1,700,000 gallons of Power & Industrial Alcohol. | Do. |

## APPENDIX V

## ALCOHOL BASED INDUSTRIES AND THEIR SCOPE FOR DEVELOPMENT.

**CATEGORY I.** **Direct reaction products—Alcohol chemically converted.**

| Products | Process | Use of the product | Suggested target by 1961 | Alcohol required for reaching the target | Remarks |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1. Ether ... | Dehydration with Sulphuric acid or alumina. | Solvent.<br>Anaesthetic. | 1,500,000 lbs. | 300,000 gals. | Capacity already exists. If the price is kept low demand can go up for use as solvent in the organic chemical industries. |
| 2. Ethyl Chloride... | Treatment with Hydrochloric acid. | Anaesthetic.<br>Chemical intermediate. | 800 tons. | 180,000 | Part capacity available Use as chemical intermediate to be developed. |
| 3. Acetone ... | Special Cracking process. | General Solvent.<br>Solvent for acetylene. Manufacture of diacetone alcohol, hexanol isophorone etc. Solvent for cellulose acetate and cordite. | 2,000 tons (Exclusive of acetate rayon) | 600,000 | Capacity available is 1500 tons. But new capacity may be developed to use isoprodyl alcohol as raw material. |

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| 4. Chloral (including D.D.T.) | Combined oxidation and chlorination. | Chloral as anaesthetic.<br>D.D.T. as insecticide. | 2,800 tons. D.D.T. +50 ton chloral | 3,00,000 | Use as chloral is small. Capacity exists and expansion is being given effect to for D. D. T. manufacture. |
| 5. Ethyl acetate (and other esters). | Esterification with acetic acid or corresponding acid. | A solvent of extensive application. | 2000 tons. (exclusive of acetate rayon) | 1,80,000 | Part capacity exists. Requirement in the projected factory for organic intermediates for Dyes and Pharm. which is under contemplation. |
| 6. Mercury fulminate. | Boiling mercury nitrate with Nitric acid and alcohol. | As detonator for explosives. | ... | ... | Requirements may be small. |
| 7. Ethylene for the following items. | Ethylene produced by dehydration and reacted further as under. | ... | ... | ... | |
| (a) Polyethylene | Polymerisation of ethylene (catalysts & pressure). | Versatile Plastic material. | 5,200 tons. | 3,000,000 | Projects already taken up by two parties. |
| (b) Ethylene Dichloride. | Reaction with Chlorine. | Mostly as fumigant. | 3,000 tons. | 400,000 | Under implementation. |

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| (c) Ethylene oxide, glycol and deratives. | Treatment with HOCl and hydrolysing and distillation. | Ethylene oxide is a useful chemical intermediate for various items including detergents and Glycol and its other deratives extensively used as solvents and special reagents. | 1,500 tons as oxide. | 600,000 | Ethylene oxide also required for Intermediates factory is covered |
| (d) Ethylene dibromide. | Reaction with bromine. | As fumigant and in TEL compositions. | 100 tons. | 20,000 gls. | To be developed along with manufacture of TEL. |
| (e) Vinyl chloride | Conversion to Ethylene dichloride and removal of Hcl therefrom. | For polymerisation to PVC. | 1,000 tons. | 200 000 | May be developed as cheap carbide is not readily available as alternate material. |
| (f) Styrene ... | Condensation with benzene and removal of Hydrogen. | For synth rubber and polystyrene. | ... | ... | Not likely to be resorted to as alternative source of cheaper ethylene is possible. |
| 8. Acetaldehyde for the following items. | Produced by oxidation of alcohol with air in the presence of catalyst and further processed as under : | | | | |
| (a) Paraldehyde | Trimerisation by dil acid. | Use as spl. denaturant. | | | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| (b) Aldol ... | Condensation with Alkali. | For denaturant and intermediate for other products. | 1,200 tons. | 680,000 | Some of these are required for the Intermediates factory. |
| (c) Acetal ... | Condensation with alcohol. | Chemical intermediate. | | | |
| (d) Aldehyde ammonia. | Condensation with ammonia. | Drugs. | | | |
| (e) Pentaery thritol. | Condensation with formal dehyde. | Sweetening agent, for explosive PETN etc. | | | |
| (f) Picolines ... | Condensation with amonia.<br>(Spl. catalyst). | Chemical raw material for INH Dyes, Nicotinic Acid etc. | | | |
| (g) Acetic Acid... | Oxidation with catalyst and air. | For chemicals; Used in Textiles & Rubber Industry. For acetates and acetic anhydride. | 8,000 tons (exclusive of rayon). | 2,240,000 | Large requirement for Intermediates and Dyes plants. Some capacity exists. |
| (h) Acetic anhydride. | By direct oxidation to produce both acetic acid and anhydride or by cracking acetic acid to ketene and combining it with more acetic acid. | Mainly for cellulose acetate, Acetate Rayon and Chem. intermediate. | 1,500 tons (exclusive of Cellulose acetate and rayon). | 600,000 | For direct use as Chem. Intermediate only. |

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| (i) Crotonaldehyde | Condensation to aldol and its dehydration with acid. | As denaturant and for butanol and butyraldehyde. | 600 tons. | 80,000 | Large quantity of butyl alcohol and butyl acetate required for manufacture of penicillin and in lacquers industry. |
| (j) N-butanol ... | By hydrogenation of crotonaldehyde. | General solvent and for butyl esters. | 750 tons. | | |
| (k) Octanol, & butyraldehyde butyric acid | Further condensation derivative of crotonaldehyde. | Solvent direct and as esters. | 300 tons. | | |
| (l) Acetate rayon | Acetylation of cotton with acetic anhydride and acetic acid and spinning it from a solution in acetone. | For textiles. | 9,000 tons. | 4,500,000 | Production established at 5 tons per day and addl. licences issued or approved for a further capacity of 13 tons a day. |
| (m) Cellulose acetate for raw films and moulding powder. | Acetylation of cellulose with acetic anhydride & acetic acid. | Acetate films are preferred to cell nitrate and extensive use for moulded plastics | 3,000 tons. | 1,500,000 | Proposals under consideration. |
| (n) Vinyl Acetate | From acetic anhydride and acetaldehyde. | For plastics compositions | 300 tons. | ... | Included in acetic anhydride demand. |
| (o) Butadiene ... | By reaction of aldehyde with alcohol (spl. catalysts). | For manufacture of GRS synth. rubber by combining with styrene. | 15,000 tons. | 12,000,000 | Under consideration. |

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| **CATEGORY II.** | **Alcohol used as processing material—not converted chemically and products free from alcohol, which is generally recovered for reuse** | | | | |
| 9(a) Cellulose and its derivations | Purification and dehydration of the product. | | | 300,000 | Only an over all rough estimate is possible. |
| (b) Sod. Hydro-sulphite. | | | | | |
| (c) Various organic chemicals. | | | | | |
| 10(a) Pectin. | For extraction, precipitation, crystallisation, etc. | | | 300,000 | Only an overall rough estimate is possible. |
| (b) Certain food products including vegetable oils | | | | | |
| (c) Crude drugs | | | | | |
| (d) Glandular products. | | | | | |
| (e) Enzyms like papain. | | | | | |
| (f) Other medicinal chemicals including alkaloids | | | | | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| 11(a) Various chemical products including dyes, drugs, intermediates. | As vehicle or medium for chemical reactions. | | | 500,000 | |
| (b) Solvent for phenolic laminates and other plastic products. | As medium for resins and adhesives. | | | | |
| **CATEGORY III.** | **Used as solvent or vehicle—Products contain alcohol in a non-potable form.** | | | | |
| 12(a) Lacquers. | | | | 1,000,000 | |
| (b) Varnishes including shellac. | | | | | |
| (c) Synthetic resin preparations. | | | | | |
| (d) Other surface coatings. | | | | | |
| (e) Photographic films and emulsions. | | | | | |
| (f) Polishes, inks and stains. | | | | | |
| (g) Adhesives and binders. | | | | | |
| (h) Cleaning preparations. | | | | | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| (i) External pharmaceutical preparations. | | | | | |
| (j) External disinfectants and sterlising preservatives. | | | | | |
| (k) Proprietory solvents. | | | | | |
| **CATEGORY IV.** | **Used as solvent or vehicle.** | **Products contain alcohol not necessarily in non-potable form.** | | | |
| 13. Pharmaceutical preparations for internal use. | | | | 500,000 | |
| 14. (a) Perfume materials and fixatives. | | | | | |
| (b) Toilet soaps and shampoos. | | | | | |
| (c) Body deodorants and rubbing compositions. | | | | | |
| (d) Hair and scalp preparations. | | | | | |
| (e) Mouth washes and toilet waters. | | | | | |
| (f) Face and hand lotions. | | | | | |
| 15. (a) Tobacco sprays and flavours. | | | | | |
| (b) Essences and flavouring materials. | | | | | |
| (c) Miscellaneous. | | | | | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| **CATEGORY V.** | **Used directly—high strength completely denatured aclohol used as such.** | | | | |
| 16. Domestic purposes. | | As fuel etc, | | 4,000,000 | |
| 17. (a) Antifreeze. | | | | | |
| (b) Brake fluid. | | | | | |
| (c) Scientific instruments. | | As fluid. | | | |
| (d) Miscellaneous. | | ,, ,, | | | |
| | | | Total ... | 34·6 million gallons. | |

## APPENDIX VI.

# LIST OF SUGAR FACTORIES IN OPERATION AND NEWLY LICENSED UP TO 30-9-56 WITH EXPECTED CAPACITY FOR CANE.

**(Cases approved for licensing upto 30-11 56 have also been taken into account**

| S No. | Name of the firm & location | Existing cane crushing capacity (tons) | Expansion/ New capacity licensed. | Final capacity of cane crushing daily (tons) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| | **Bihar.** | | | |
| 1. | M/s. Gaya Sugar Mills Ltd., Guraru, Gaya. | 850 | | 850 |
| 2. | ,, The South Bihar Sugar Mills Ltd., Bihta, Patna. | 1200 | | 1200 |
| 3. | ,, Mohini Sugar Mills Ltd., Warisaliganj, Gaya. | 700 | | 700 |
| 4. | ,, Rohtas Industries Ltd., Dalmianagar, Shahabad. | 1800 | | 1800 |
| 5. | ,, The Durbhanga Sugar Co., Ltd., Sakri, Darbhanga. | 800 | | 800 |
| 6. | ,, The Darbhanga Sugar Co., Lohat, Darbhanga. | 1300 | | 1300 |
| 7. | ,, Samastipur Central Sugar Co., Ltd., Samastipur, Darbhanga. | 795 | | 795 |
| 8. | ,, Ryam Sugar Co. Ltd., Ryam Factory, Darbhanga. | 779 | | 779 |
| 9. | ,, New India Sugar Mills Ltd., Hassanpur Road, Darbhanga. | 1200 | 400 | 1600 |
| 10. | ,, Motipur Sugar Factory Ltd, Motipur, Muzaffarpur. | 1200 | | 1200 |
| 11. | ,, Belsund Sugar Co. Ltd., Righa, Muzaffarpur. | 850 | 350 | 1200 |
| 12. | ,, Champaran Sugar Co. Ltd., Bara-Chakia, Champaran. | 932 | | 932 |
| 13. | ,, Shree Hanuman Sugar Mills Ltd., Motihari, Champaran. | 850 | 150 | 1000 |
| 14. | ,, The Sugauli Sugar Works Ltd.; Sugauli, Champaran. | 900 | | 900 |
| 15. | ,, Motilal Padampat Sugar Mills Co. Ltd.; Majhaulia, Champaran. | 1000 | 500 | 1500 |
| 16. | M/s. Champaran Sugar Co. Ltd.; Chanpatia, Champaran. | 870 | | 870 |
| 17. | ,, S. K. G. Sugar Ltd., Lauriya, Champaran. | 1170 | | 1170 |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 18. | ,, The New Swadeshi Sugar Mills Ltd.; Narkatiaganj, Champaran. | 1000 | 300 | 1300 |
| 19. | ,, Harinagar Sugar Mills Ltd. Harinagar, Champaran. | 1500 | 300 | 1800 |
| 20. | ,, North Bihar Sugar Mills Ltd.; Naraipur, Champaran. | 650 | 350 | 1000 |
| 21. | ,, Sitalpur Sugar Works Ltd., Gorul, Muzaffarpur. | 800 | | 800 |
| 22. | ,, Cawnpore Sugar Works Ltd., Marhowrah, Saran. | 930 | | 930 |
| 23. | ,, The Bihar Sugar Works Ltd.; Pachrukhi, Saran. | 1110 | | 1110 |
| 24. | ,, New Savan Sugar & Gur Refining Co. Ltd.; Siwan, Sarrn. | 900 | | 900 |
| 25. | ,, Indian Sugar Works, Siwan, Saran. | 700 | | (closed) |
| 26. | ,, Bharat Sugar Mills Ltd., Sidwalia, Saran. | 650 | | 650 |
| 27. | ,, Sasa Musa Sugar Works Ltd.; Sasa Musa, Saran. | 800 | | 800 |
| 28. | ,, Vishnu Sugar Mills Ltd., Harkua, Gopalganj, Saran. | 800 | | 800 |
| 29. | ,, S. K. G. Sugar Ltd., Hathua, Saran. | 1500 | | 1500 |
| 30. | ,, Purnea Co-operative Sugar Factory Ltd.; Banmankhi Dt. Purnea. (New) | — | | 800 |
| | | Total; | | 30986 |
| | **West Bengal.** | | | |
| 31. | ,, Shree Radha Krishna Sugar Mills Ltd.; Beldanga, Murshidabad. | 750 | | (closed) |
| 32. | ,, The Ramnuggar Cane & Sugar Co. Ltd.; Plassey, Nadia. | 800 | 400 | 1200 |
| 33. | ,, Shri M. N. Mitra, Calcutta, Factory at Ahmedpur (Birbhum) West Bengal. | — | | 600 |
| 34. | M/s. Gladstone Lyall & Co. Ltd.; Panagarh. | | | 1000 |
| | | Total: | | 2800 |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| | **Assam.** | | | |
| 35. | ,, Assam Sugar Mills & Distilleries Ltd.; Dimapur (Assam). | — | 1000 | 1000 |
| 36. | ,, Assam Co-operative Sugar Mills, Kuralaguri, (Dt. Shibsagar). | — | 800 | 800 |
| | | Total: | | 1800 |
| | **Orissa.** | | | |
| 37. | ,, Jeypore Sugar Co. Ltd.; Rayagada, (Korapur). | 250 | 350 | 600 |
| 38. | ,, Aska Co-operative Sugar Industries, Ltd., Aska, Dt. Ganjam. | — | 1200 | 1200 |
| | | Total: | | 1800 |
| | **Andhra.** | | | |
| 39. | ,, The Vizagapatam Sugar & Refinery Ltd., Anakapalle, Vizagapatam. | 300 | 900 | 1200 |
| 40. | ,, Sri Rama Sugars & Industries Ltd., Bobbili, Srikakulam. | 450 | | 450 |
| 41. | ,, Sri Rama Sugar & Industries Ltd., Seethanagaram, Srikakulam, | 300 | 300 | 600 |
| 42. | ,, The K. C. P. Ltd., Vuyyuru, Kistna. | 1800 | 700 | 2500 |
| 43. | ,, The Kirlampudi Sugar Mills Ltd , Pithapuram, East Godavari. | 600 | 300 | 900 |
| 44. | ,, The Deccan Sugar & Abkari Co; Ltd.; Samalkot, East Godavari. | 500 | | 500 |
| 45. | ,, The Andhra Sugars Ltd.; Tanuku, West Godavari. | 600 | 400 | 1000 |
| 46. | ,, Etikoppaka Sugar Factory No. II, Darlapudi, Vizagapatam. | 600 | 400 | 1000 |
| 47. | ,, Etikoppa Sugar Factory, No. I, Etikoppaka. | 75 | | (closed) |
| 48. | ,, Challapalli Sugars Ltd., Challapalli. | — | 800 | 800 |
| 49. | M/s. K. C. P. Ltd., Kaikalur, (Dt Krishna). | — | 800 | 800 |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 50. | ,, V. V. Sugars Ltd., Repalle, (Dt. Guntur). | — | 800 | 800 |
| 51. | ,, Shri S. B. P. K. Satyanarain Rao Mills, Ramchandrapuram, East Godavari. | — | 1000 | 1000 |
| 52 | ,, The Amadalavalasa Co-operative Agrl. & Industrial Society Ltd., Amadalavalasa, Dt. Srikakulam. | — | 1200 | 1200 |
| 53. | ,, The Chittor Co-operative Sugar Ltd.; Chittoor, Dt. Chittoor. | — | 1000 | 1000 |
| 54. | ,, The Hindupur Agricultural & Industrial Co-operative Society Ltd., Hindupur. | — | 600 | 500 |
| 55. | ,, The Chodavaram Co-operative Sugar Factory Ltd.,.Chodavaram Taluk, Distt. Visakhapatnam. | — | 1000 | 1000 |
| 56. | ,, The Palakole Co-operative Agri. & Industrial Society Ltd ; Palakole, Naraspur Taluk, West Godavari. | — | 1000 | 1000 |
|  |  | Total: |  | 16350 |
|  | **Madras State.** |  |  |  |
| 57. | ,, The East India Distilleries & Sugar Factories Ltd.; Nellikuppam, South Arcot. | 2200 |  | 2200 |
| 58. | ,, The Deccan Sugar & Abkari Co.; Ltd., Pugalur Sugar Factory, Trichinopoly. | 800 |  | 800 |
| 59. | ,, The Madura Sugar & Allied Products Ltd., Pandiarajapuram, Madura. | 240 |  | 240 |
| 60. | ,, The Murugappa Sugar Co.; Ltd., Mailpatti, N. Arcot. | 400 |  | (closed |
| 61. | ,, East India Distilleries & Sugar Factory, Kolianur (S. Arcot) | — | 800 | 800 |
| 62. | M/s. North Arcot Coop. Sugar Mills, Vellore. | — | 800 | 800 |
| 63. | ,, Amravati Coop. Sugar Mills, Udmalpet (Coimbatore). | — | 900 | 900 |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 64 ,, | The Thiruvarooran Sugar Ltd. Vadapathimangalam Dt. Tanjore. New | — | 1200 | 1200 |
| 65. ,, | Shri Pushpavanam Sugar Factory Poondi. New | — | 1000 | 1000 |
| 66. ,, | Cauvery Sugars & Chemicals Ltd. Pettavaithalai Dt. Trichnopoly. New | — | 800 | 800 |
| 67 ,, | Champaka Sugar Plantations Ltd. Edayankottai Dt., Tanjore. New | — | 800 | 800 |
| 68. ,, | Madurantakam Coop. Sugar Mills Sethupakkam, Tehsil Madurantakam, Dt. Chingleput. New | — | 1000 | 1000 |
| | | Total : | | 10540 |
| | **MYSORE** | | | |
| 69. ,, | Mysore Sugar Co; Ltd; Mandya, Mysore State. | 1400 | — | 1400 |
| 70. ,, | The India Sugars & Refineries Ltd. Hospet, Bellary. | 600 | 400 | 1000 |
| 71 ,, | Tungabhadra Sugar Works, Shimoga. | — | 1000 | 1000 |
| 72. ,, | Bellary Central Coop. Works, Kampli, (Hospet). | — | 600 | 600 |
| 73. ,, | Pandavapura Shahkri Shakar Karkhana, Pandavapuram (Mandya). | — | 800 | 800 |
| | | Total : | | 4800 |
| | **HYDERABAD.** | | | |
| 74 ,, | The Nizam Sugar Factory Ltd; No. I. Shakarnagar, Hyderabad. | 1200 | 550 | 1750 |
| 75. ,, | The Nizam Sugar Factory Ltd. No. II. Shakarnagar, Hyderabad State. | 2000 | 750 | 2750 |
| 76. ,, | The Salar Jung Sugar Mills Ltd; Munirabad, Raichur Dt. Hyderabad State. | 220 | 380 | 600 |
| 77. ,, | Shankar Udyog Ltd; Gangapur, (Aurangabad). | — | 850 | 850 |
| 78. ,, | Gangavati Sugars Ltd; Gangavati (Raichur). | — | — | — |
| | | Total : | | 5950 |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
|  | **TRAVANCORE–COCHIN STATE.** |  |  |  |
| 79. | ,, The Travancore Sugars & Chemicals Ltd; Tiruvalla, Quilon. | 500 | — | 500 |
|  |  | Total : |  | 500 |
|  | **UTTAR PRADESH.** |  |  |  |
| 80. | ,, Mawana Sugar Works, Mawana, Meerut. | 822 | 1178 | 2000 |
| 81. | ,, Sir Shadilal Sugar & General Mills, Ltd; Mansurpur, Muzaffarnagar. | 1100 | 700 | 1800 |
| 82. | ,, Upper India Sugar Mills Ltd. Khatauli, Muzaffarnagar. | 1200 | 500 | 1700 |
| 83. | ,, Amritsar Sugar Mills Co; Ltd; Rohanakalan, Muzaffarnagar. | 1208 | 142 | 1350 |
| 84. | ,, Upper Doab Sugar Mills Ltd; Shamli, Muzaffarnagar. | 1429 | 1571 | 3000 |
| 85. | ,, Diwan Sugar & General Mills Ltd; Sakhotitanda, Meerut. | 717 | 383 | 1100 |
| 86. | ,, Daurala Sugar Works, Daurala, Meerut. | 1400 | 1100 | 2500 |
| 87. | ,, Jaswant Sugar Mills Ltd; Meerut City, Meerut. | 1200 |  | 1200 |
| 88. | ,, Ram Luxman Sugar Mills, Mohiuddinpur, Meerut. | 750 | 390 | 1140 |
| 89. | ,, Modi Sugar Mills Ltd; Modinagar, Meerut. | 940 | 110 | 1050 |
| 90. | ,, Simbhaoli Sugar Mills Ltd; Simbhaoli, Meerut. | 850 | 1150 | 2000 |
| 91. | ,, The Lakshmi Sugar & Oil Mills Ltd; Hardoi. | 1572 | 228 | 1800 |
| 92 | ,, The Oudh Sugar Mills Ltd; Hargaon, Sitapur. | 1925 | 675 | 2600 |
| 93. | ,, The Lakshmiji Sugar Mills Co. Ltd; Maholi, Sitapur. | 1250 | 550 | 1800 |
| 94. | M/s Govind Sugar Mills Ltd; Aira Estate, Lakhimpur, Kheri. | 650 | 550 | 1200 |
| 95. | ,, The Hindusthan Sugar Mills Ltd; Golagokarannath, Kheri. | 1928 | 1672 | 3600 |
| 96. | ,, Rosa Sugar Works & Distillery of Carew & Co; Ltd, Rosa, Shahjahanpur. | 725 |  | 725 |
| 97. | ,, H. R. Sugar Factory, Ltd; Bareilly. | 902 | 98 | 1000 |
| 98. | ,, The Kesar Sugar Works Ltd; Baheri, Bareilly. | 1280 | 900 | 2180 |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 99. | ,, L. H. Sugar Factories & Oil Mills Ltd. Pilibhit. | 1750 | | 1750 |
| 100. | ,, Upper Ganges Sugar Mills Ltd. Seohara, Bijnor. | 2500 | 700 | 3200 |
| 101. | ,, Shiv Prasad Banarsidas Sugar Mills Bijnor. | 1050 | | 1050 |
| 102. | ,, The Dhampur Sugar Mills Ltd. Dhampur, Bijnor. | 900 | 1100 | 2000 |
| 103. | ,, Shri Janki Sugar Mills & Co; Doiwala, Dehra-Dun. | 520 | | 520 |
| 104. | ,, The Ganga Sugar Corpn, Ltd; Deoband, Shaharanpur. | 1000 | 600 | 1600 |
| 105. | ,, R. B. Narain Singh Sugar Mills Ltd; Lhaksar, Saharanpur. | 1250 | 250 | 1500 |
| 106. | ,, Lord Krishna Sugar Mills Ltd; Saharanpur | 1250 | 250 | 1500 |
| 107. | ,, Panniji Sugar & General Mills Co; Panninagar, Bulandshahar. | 786 | | 786 |
| 108. | ,, L. H. Sugar Factories & Oil Mills Ltd; Kashipur, Naini Tal. | 650 | | 650 |
| 109. | ,, The Neoli Sugar Factory, Neoli. Etah. | 895 | | 895 |
| 110. | ,, Kundan Sugar Mills, Amroha. Moradabad. | 1235 | 1015 | 2250 |
| 111. | ,, The Ajudhia Sugar Mills Raja-Ka-Sahaspur, Moradabad. | 1250 | 250 | 1500 |
| 112. | ,, Raza Sugar Co; Ltd; Rampur. | 1150 | | 1150 |
| 113. | ,, Buland Sugar Co; Ltd; Rampur. | 1000 | 500 | 1500 |
| 114. | M/s Mahaluxmi Sugar Mills Co; Ltd; Iqbalpur, Saharanpur. | 1800 | | 1800 |
| 115. | ,, Baghpat Coop. Sugar Mills Baghpat. | New | 1000 | 1000 |
| 116. | ,, Thakur Dan Singh Bist., Kicha. (Nainital). | New | 2000 | 2000 |
| 117. | ,, Nawabganj Sugar Mills, Harduaganj. | Shifting | 800 | 800 |
| 118. | ,, The Co-operative Sugar Factory Ltd; Bazpur District Nainital. | New | 1200 | 1200 |
| 119. | ,, The Kisan Coop. Sugar Mills, Sarsawa, Dist. Saharanpur. | New | 1200 | 1200 |
| 120. | ,, R. B. Lachmandas Sugar & General Mills Ltd; Jarwal Road, Bahraich. | 865 | 235 | 1100 |
| 121. | ,, The Burhwal Sugar Mills Co; Ltd; Burhwal, Barabanki. | 651 | | 651 |
| 122. | ,, Seth Ramchand & Sons Sugar Mills Ltd; Barabanki. | 793 | | 793 |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 123. | ,, Ratna Sugar Mills Co; Ltd; Shahganj, Jaunpur. | 1000 | 100 | 1000 |
| 124. | ,, Shree Krishna Deshi Sugar Jhusi, Allahabad. | 600 | | (closed) |
| 125 | ,, The Seksaria Biswan Sugar Factory, Biswan, Sitapur. | 1200 | | 1200 |
| 126. | ,, Purtabpore Co; Ltd; Mairwa, Deoria. | 784 | | 784 |
| 127. | ,, Noori Sugar Works, Bhatni, Deoria. | 726 | | 726 |
| 128 | ,, Shree Sitaram Sugar Co; Ltd; Baitalpur, Deoria. | 900 | | 900 |
| 129. | ,, Cawnpore Sugar Works Ltd; Gauribazar, Deoria. | 738 | | 738 |
| 130. | ,, Deoria Sugar Mills Ltd; Deoria. | 950 | | 950 |
| 131. | ,, Saraya Sugar Factory, Sardarnagar, Gorakhpur. | 2250 | | 2250 |
| 132. | ,, Diamond Sugar Mills Ltd; Pipraich, Gorakhpur. | 800 | | 800 |
| 133. | ,, The Shankar Sugar Mills Ltd; Captainganj, Deoria. | 955 | | 955 |
| 134. | M/s. The Punjab Sugar Mills Co., Ltd.; Ghughli, Gorakhpur. | 1000 | | 1000 |
| 135. | ,, Mahabir Sugar Mills Ltd.; Siswabazar, Gorakhpur. | 550 | | 550 |
| 136. | ,, The Vishnu Pratap Sugar Khadda, Deoria. | 761 | | 761 |
| 137. | ,, The Lakshmi Devi Sugar Mills Ltd.; Chitauni, Deoria. | 727 | | 727 |
| 138. | ,, Ishwari Khetan Sugar Mills Ltd., Lakhmiganj, Deoria. | 732 | | 732 |
| 139. | ,, The Ramkola Sugar Mills Co. Ltd ; Ramkola, Deoria. | 1100 | 400 | 1500 |
| 140. | ,, Maheshwari Kehtan Sugar Mills Ltd., Ramkola, Deoria. | 779 | | 779 |
| 141. | ,, The Padrauna Rajkrishna Sugar Works Ltd., Padruuna, Deoria. | 1000 | | 1000 |
| 142. | ,, Jagdish Sugar Mills Ltd., Kathkuiyan, Deoria. | 600 | | 600 |
| 143. | ,, The United Provinces Sugar Co; Ltd; Seorahi, Deoria. | 925 | | 925 |
| 144. | ,, Ganesh Sugar Mills Ltd., Anandnagar, Gorakhpur. | 723 | | 723 |

| 1 | | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 145. | ,, | The Madho Kanhaya Mahesh Gauri Sugar Mills Ltd.; Munderwa, Basti. | 700 | | 700 |
| 146. | ,, | The Basti Sugar Mills Co.; Ltd.; Basti. | 1009 | | 1009 |
| 147. | ,, | Shree Anand Sugar Mills Ltd., Khalilabad, Basti. | 550 | | 550 |
| 148. | ,, | The Seksaria Sugar Mills Ltd.; Babhnan, Gonda. | 800 | | 800 |
| 149. | ,, | Nawabgani Sugar Mills Co. Ltd.; Nawabganj Gonda. | 1850 | One plant to be shifted. | 1050 |
| 150. | ,, | Balrampur Sugar Mills Balrampur, Gonda. | 768 | | 768 |
| 151. | ,, | The Basti Sugar Mills Co., Ltd.; Walterganj, Basti. | 760 | | 760 |
| 152. | ,, | Balrampur Sugar Co. ;Ltd.; Tulsipur, Gonda. | 764 | | 764 |
| 153. | ,, | Kamlapat Motilal Sugar Mills Motinagar, Faizabad. | 1100 | 200 | 1300 |
| | | | **Total:** | | **93340** |
| | | **Punjab & Pepsu.** | | | |
| 154. | M/s. | Saraswati Sugar Mills Yamnanagar, Ambala. | 1100 | 2150 | 3250 |
| 155. | ,, | Panipat Sugar Mills, Panipat. | — | 1250 | 1950 |
| 156. | ,, | Haryana Co-operative Sugar Mills, Rohtak, | — | 1000 | 1000 |
| 157. | ,, | Janta Co-operative Sugar Mills, Jullunder. | — | 1000 | 1000 |
| 158. | ,, | Morinda Coop. Sugar Mills, Morinda, Dt. Ambala. | — | 1250 | 1250 |
| 159. | ,, | Jagatjit Sugar Mills Co.; Ltd.; Phagwara, Kapurthala. | 850 | 350 | 1200 |
| 160. | ,, | Malwa Sugar Mills Co.; Ltd.; Dhuri, Sangrur. | — | 1000 | 1000 |
| 161. | ,, | Jagatjit Distillery & Allied Industries, Jagatjitnagar, Hamia. | — | 800 | 800 |
| | | | Total: | | 10750 |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
|  | **Rajasthan & Ajmer.** |  |  |  |
| 162. | ,, Raiasthan Government Sugar Factory, Sri Ganganagar, Rajasthan. | 600 |  | 600 |
| 163. | ,, The Mewar Sugar Mills Ltd.; Bhupalsagar, Udaipur. | 500 |  | 500 |
| 164. | ,, Shree Bijay Sugar Mills Ltd., Bijaynagar, Dt. Ajmer. | 450 |  | 450 |
|  |  | Total: |  | 1550 |
|  | **Madhya Bharat & Bhopal.** |  |  |  |
| 165. | ,, The Jaora Sugar Mills, Jaora, Ratlam. | 600 |  | 600 |
| 166. | ,, The Gwalior Sugar Co.; Ltd., Dabra, Madhya Bharat. | 700 | 400 | 1100 |
| 167. | ,, The Jiwaji Rao Sugar Co.; Ltd., Dalauda, Mandsar. | 550 |  | 550 |
| 168. | ,, The Maharani Parvati Sugar Mills Ltd., Sarangpur, Madhya Bharat. | 350 |  | (closed) |
| 169. | ,, Seth Govindram Sugar Mills, Mehidpur Road, Madhya Bharat. | 300 |  | 300 |
| 170. | ,, Bhopal Sugar Industries Ltd., Sehore, Bhopal. | 1000 |  | 1000 |
|  |  | Total: |  | 5550 |
|  | **Bombay & Saurastra.** |  |  |  |
| 171. | M/s. Bhavnagar Sugar Mills Ltd., Dhola Jn. | — | 400 | 400 |
| 172. | ,, The Saswadmali Sugar Factory Ltd., Malinagar, Sholapur. | 525 | 475 | 1000 |
| 173. | ,, The Brihan Maharashtra Sugar Syndicate Ltd; Shreepur, Sholapur. | 1000 |  | 1000 |
| 174. | ,, Walchandnagar Industries Ltd; Walchanndnagar, Poona. | 1400 |  | 1400 |
| 175. | ,, The Ravalgaon Sugar Farm Ltd; Ravalgaon, Nasik. | 850 | 350 | 1200 |
| 176. | ,, The Belapur Co; Ltd; Harigaon, Ahmednagar. | 1000 |  | 1000 |
| 177. | ,, The Maharashtra Sugar Mills Ltd; Tilaknagar, Ahmednagar. | 1000 |  | 1000 |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 178. | ,, Belvandi Sugar Farm, Ltd; Belvandi Sugar Farm, Ahmednagar. | 250 | | 250 |
| 179. | ,, Godavari Sugar Mills Ltd; Sakarwadi, Ahmedanagar. | 800 | 200 | 1000 |
| 180. | ,, The Somaiya Sugar Factory, Laxmiwadi, Via Kopergaon, Ahmednagar. | 600 | 300 | 1000 |
| 181. | ,, Shree Changdeo Sugar Mills, Ltd; Changdeonagar. | 500 | 300 | 800 |
| 182. | ,, The Phaltan Sugar works Ltd; Sakharwadi, Satara North. | 800 | | 800 |
| 183. | ,, The Kolhapur Sugar Mills, Kasaba Bavada, Kolhapur. | 850 | 850 | 1700 |
| 184. | ,, The Ugar Sugar Works, Ltd; Ugar Khurd, Belgaum. | 400 | 400 | 800 |
| 185. | ,, Krishna Sugar Mills Ltd; Krishnakittur. | 200 | 300 | 500 |
| 186. | ,, The Pravara Sahakari Sakhar Karkhana Ltd; Pravaranagar, Ahmednagar | 450 | 1000 | 1450 |
| 187. | ,, W. D. Chitle Sugar Factory, Malsiras, Sholapur. | | 800 | 800 |
| 188. | ,, Deccan Agricultural Industries Ltd; Malisiras, Sholapur. | — | 400 | 400 |
| 189. | ,, Kopergaun Shahkarkarkhana, Kopergaon, Ahmednagar. | — | 800 | 800 |
| 190. | ,, Khedut Shahkari Khand Udyog Mandal, Baban Bardoli, Dt. Surat. | — | 800 | 800 |
| 191. | ,, Bhogavati Co-operative Sugar Factory, Shahupuri, Ghohawade Kolhapur. | — | 1000 | 1000 |
| 192. | ,, Malegaon Shahkari Shakar Factory, Baramati, Poona Distt | — | 1000 | 1000 |
| 193. | ,, Samkeswar Co-operative Sugar Factory, Samkeshwar, Belgaum District. | — | 800 | 800 |
| 194. | ,, Panchanganga Co-operative Sugar Factory, Ichalakaranji Dt. Kolhapur. | — | 1000 | 1000 |
| 195. | ,, Warna Co-operative Sugar Factory, Kodoli, Dt. Kolhapur. | — | 1000 | 1000 |
| 196. | ,, Rahuri Co-operative Sugar Factory, Devlali Dt. Ahmednagar. | — | 1200 | 1200 |
| 197. | ,, Karegaon Co-operative Sugar Factory, Nipani Sirampur, District Ahmednagar. | — | 1000 | 1000 |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 198. | ,, Krishna Co-operative Sugar Factory, Julewadi, Dt. Satara. | — | 800 | 800 |
| 199. | ,, Govindlal Bansitlal, Jamkhandi, Dist. Bijapur. | — | 1000 | 1000 |
| 200. | ,, Rahat Vibhag Co-operative Sugar Factory, Rahata Dist. Ahmednagar. | — | 1000 | 1000 |
| 201. | ,, Sri Ram Co-operative Sugar Factory, Phaltan. | — | 1000 | 1000 |
| 202. | ,, Girna Co-operative Sugar Factory Malegaon. | — | 1000 | 1000 |
| 203. | ,, Chatrapati Shivaji Co-operative Sugar Factory, Sansar, Poona. | — | 800 | 800 |
| | | | Total : | 30700 |

# APPENDIX VII.

## Denaturants for Alcohol

The denaturants for Industrial Alcohol have the primary objective of discouraging its possible diversion or misuse for potable purposes. Where the alcohol is to be used as such as in the case of miscellaneous domestic uses, the alcohol could be more or less completely denatured so as to render it obnoxious and poisonous when drunk. On the other hand when the alcohol is to be used in an industrial process addition of ingredients so as to make it completely denatured may not always be possible. Then alcohol is used in this manner, it is subject to control and check by officers of Government from time to time, and as such there may be no serious danger in arranging for the supply of alcohol in a mildly denatured form. Some of the chemical processes employing alcohol are of a delicate nature and the presence of extraneous material even in very small proportions might seriously upset the process by inhibiting the catalyst employed or promoting undesirable side reactions. It is necessary that the special denaturant prescribed for alcohol to be used in different industrial processes should be closely related to the processes in question. The criterion that the alcohol should be rendered non-potable may be difficult of compliance. In certain cases even undenatured pure rectified spirit may have to be made available for industrial uses.

It is not proposed to deal exhaustively with the appropriate denaturants to be prescribed for various grades of industrial alcohol required in different industries. This note only examines the requirements of special denaturants for some categories of industries listed in Appendix V so that necessary assistance may be rendered immediately by Government. The suggestion of particular denaturants given in some cases may not be applicable for different processes resulting in the same product and it might, therefore, be necessary to include alternative special denaturants. Individual cases should be considered by a standing technical Committee and the list of special denaturants extended to include special needs.

In deciding upon special denaturants in appropriate cases, the question of cost of the denaturant, its local availability, feasibility of its transport to the distilleries and its stability during storage and transport of the denatured alcohol, also come into play to various extents. To meet these difficulties a choice of several denaturants is also suggested in the case of certain processes and the adoption of one or other may be left to be decided by the particular consumer. It should also be possible for the consumer of industrial alcohol to transport alcohol in an undenatured form from distilleries to his premises and carry out the denaturation at his premises.

It has been the practice so far to prescribe some colouring matter to distinguish specially denatured spirit from ordinary denatured spirit. It is considered that such addition of colouring matter is not always essential. It would be sufficient to have consignments of specially denatured spirit distinguished by painting the containers with a prescribed colour and marking the containers with appropriate details. While addition of a colouring matter may not affect the use in some industries, it is harmful in a number of major industries and therefore as a general rule, the addition of colouring matter need not be enforced and the adoption of colours and markings on containers considered as an adequate substitute.

The special denaturants for the various industries are indicated below :—

| No. | Industry | Denaturat recommended | Remarks |
|---|---|---|---|
| 1. | ETHER ... | 5%crude ether or 1% sulphuric acid. | Sulphuric Acid is rather difficult to handle particularly during transport. It also leads to accumulation of sulphuric Acid in the alcohol evaporator of the Ether factory. A new process developed for the manufacture of Ether does not require sulphuric acid and as such its presence may be harmful. |
| 2. | ETHYL CHLORIDE | 1% Hydrochloric Acid or 5% Crude Ether or 5% Methanol. | There is difficulty in handling Hydrochloric Acid and as such the other two alternatives are suggested. Neither of these materials. would interfere appreciably with the reaction. |
| 3. | CHLORAL ... | 1% Chloral Hydrate or 0·5% acetaldehyde. | Chloral is difficult to handle. There should be no objection to the use of acetaldehyde as a denaturant but it is a gas under normal conditions in India. A solution of acetaldehyde in alcohol may be used or alternately crotonaldehyde may be employed. |
| 4. | ACETONE ... | 0.5% acetaldehyde or 2% acetone. | At present alcohol used is not denatured. There should be no objection to the adoption to either of these two denaturants as the process involved is not delicate. |
| 5. | ETHYL ACETATE | 2% acetic acid or sulphuric acid or 5% ethyl acetate. | It is not likely that any of these denaturants would interfere with the reaction and use of one of them may be allowed in accordance with the choice of the consumer. |
| 6. | OTHER ESTERS OF ETHYL ALCOHOL. | 5% methyl alcohol or 2% sulphuric acid or 2% of the appropriate acid. | In the case of individual esters like ethyl benzoate or butyrate there should be no objection to adding 2% of the acid in question as a denaturant. Alternately methyl alcohol |

| No. | Industry | Denaturant recommended | Remarks |
|---|---|---|---|
| | | | can be used as the methyl ester can always be easily separated from ethyl esters. |
| 7. | CHLOROFORM ... | 5% crude chloroform | At present bleaching powder is also prescribed as an additional denaturant. This is not considered necessary and it may also lead to difficulties due to instability of bleaching powder. |
| 8. | CHEMICALS & PRODUCTS DERIVED VIA ETHYLENE. | 0.2% crotonaldehyde or 5% ether. | Use of 0.2% crotonaldehyde has been suggested by the manufacturer of polyethylene on the basis of practical experience in the United Kingdom. On the other hand ether has been suggested by another prospective consumer and there should be no objection to adopt either of these two. |
| 9. | MANUFACTURE OF ACETALDEHYDE & DERIVATIVES INCLUDING CELLULOSE ACETATE, ACETATE RAYON & BUTADIENE. | 0.2% acetaldehyde or 0.2% crotonaldehyde. | It is not likely that the adoption of crotonaldehyde would interfere with the reaction. However, the use of acetaldehyde may also be permitted. The remarks against this denaturant given against item No. 3 above also apply here. Either a solution of acetaldehyde in alcohol or para aldehyde may have to be used. |
| 10. | ALCOHOL USED IN THE CHEMICAL & PHARMACEUTICAL INDUSTRIES FOR THE PURPOSE OF EXTRACTION PURIFICATION, CRYSTALISATION, PRECIPITATION, DRYING OR DEHYDRATION, ETC. | 5% wood alcohol or 10% pure methanol or 2% wood alcohol with 2% banzol or 5% ethyl acetate or 10% acetone or 10% ether. | A wide choice of special denaturants may be allowed depending upon the particular material or chemical that is to be handled. In most of these processes the alcohol would be recovered for reuse and arrangements may have to be made for the denaturation of the alcohol directly as it is recovered and received in storage tanks. |

| No. | Industry | Denaturant recommended | Remarks |
|---|---|---|---|
| | | | The manufacture of several drugs and pharmaceutical preparations containing Alkaloids, Caffein; Enzymes, Glandular products etc. would be covered by the use of one of these denaturants. |
| 11. | ALCOHOL USED AS A SOLVENT OR VEHICLE WITH THE PRODUCTS CONTAINING ALCOHOL IN A NON-POTABLE FORM. | As above ... | The various uses of alcholol as a solvent in the varnish, synthetic resin, surface coatings, polishes, adhesives and various other preparations can be covered with the use of any of the above denaturants. It may be possible to reduce the proportion of the denaturant in special cases where the preparations contain alcohol in the denatured form provided a small proportion of the ingredient is added to the spirit before use. For e g. acetone can be reduced to 1% provided 0.2% of shellac is added for use in the shellac varnish and French polish industries. |
| 12. | SPECIAL CASES ... | 3% Methyl violet | For Inks. |
| | | 10% Formalin | For Adhesives, disinfectants, preservative solutions, etc. |
| 13. | ALCOHOL USED AS A VEHICLE. | Various toilet preparations, flavours, essences etc. | |
| | | 1% Pine tar ... | for disinfectants. |
| | | 3.5% Methyl Propyl Ketone, with 0.5% MIBK. | for toilet requisites and perfumery. |
| | | 10% Glycerine with 2% hard soap. | Toilet requisites. |
| | | 1% Salicyclic Acid or Thymol or Menthol. | For face and hand lotions and miscellaneous preparations of external use. |

| No. | Industry | Denaturant recommended | Remarks |
|---|---|---|---|
| | | Essential oils like Euclyptus oils etc. | Toilet requisites & perfumery. |
| | | 5% Surcrose Octa-Acetate. | Toilet requisites & perfumery. |
| | | 1% Castor oil with 2% Methanol or 1% Castor oil 0.1% Caustic Soda. | For transparent soaps etc. |
| | | 1% Acetic Acid or equivalent proportion of vinegar. | In the manufacture of Vinegar. |
| | | 0.2% Nicotine ... | For tobacco sprays. |
| | | 2% Iodine and 5% Potassium Iodine | In the manufacture of tincture iodine. |
| 14. | COMPLETELY DENATURED ALCOHOL FOR DIRECT USE. | 5% crude wood naphtha or 0.5% light Caautchoucine with 0.5% Pyridine bases or 0.6% Crotonaldehyde, with 0.5% Pyridine bases. | For miscellaneous domestic use including use as fuel and as antifreeze. |
| 15. | MOTOR ALCOHOL OR POWER ALCOHOL. | 0.6% Crotonaldehyde or 5% Methanol or 5% motor Benzol. | At present 1% Kerosine oil is used which is only a nominal denaturant. One of the three denaturants mentioned, preferably Crotonaldehyde can be employed. |

## APPENDIX VIII

## ANTICIPATED MOVEMENTS OF MOLASSES BY RAIL IN TANK WAGONS FROM SUGAR FACTORIES TO DISTILLERIES AS FROM 1958 OR LATER.

**(Changeover from existing movements where required may have to be effected in 1958 or 1959).**

| Location of Sugar Factory | Qty. of molasses per yr/ tons | Destination | Railway and Guage | Remarks |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| Phagwara | 6000 | Hamira | N. Rly, B.G. | Now moved in part. Full quantities from 1958. |
| Jullundur | 5000 | ,, | ,, | |
| Dhuri | 5000 | ,, | ,, | |
| Panipat | 5000 | Karnal | ,, | By 1958. Distillery likely to shift to Rathlada. |
| Rohtak | 5000 | ,, | ,, | |
| Jagadhri | 15000 | Khasa | ,, | Distillery likely to shift to Jagadhri or Ambala. |
| Morinda | 6000 | ,, | ,, | |
| Modinagar | 5000 | Meerut Cantt | | Movement by road is likely. |
| Mohiuddinpur | 5000 | ,, | | |
| Bulandshahr | 4500 | ,, | ,, | |
| Sakhoti-Tanda | 3000 | Daurala | | Movement by road is likely. |
| Khatauli | 7500 | ,, | | |
| Rohana | 6000 | Mansurpur | ,, | From 1958. |
| Deoband | 7200 | ,, | ,, | ,, |
| Baghpat | 4500 | Shamli | SSLR/NG | |
| Ikbalpur | 7600 | Pilkhani | N.Rly/B.G. | From 1957-58. |
| Sarsawa | 6000 | ,, | ,, | |
| Doiwala | 2700 | ,, | ,, | |
| Lhaksar | 6700 | Seohara | ,, | |
| Amroha | 8000 | Simbholi | ,, | |
| ,, | 2000 | Rajakasahespur | ,, | |
| Dhampur | 5000 | ,, | ,, | |
| Harduaganj | 6000 | ,, | ,, | |
| Bareilly | 4500 | Rampur | ,, | |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Bijnor | 6000 | ,, | ,, | |
| Hardoi | 3500 | ,, | ,, | |
| ,, | 5000 | Rosa | ,, | |
| Kashipur | 3000 | Baheri | N.E, Ry/M.G. | |
| Bazpur | 7000 | Baheri | ,, | |
| Kitcha | 9000 | ,, | ,, | |
| Neoli | 4000 | Gola | ,, | |
| Pilibhit | 8000 | ,, | ,, | |
| Burhwal | 3000 | Lucknow | ,, | |
| Jarwal Road | 2000 | ,, | ,, | |
| Shahganj | 3500 | Unao | N. Ry/B.G. | |
| Fyzabad | 4500 | ,, | ,, | |
| Munderwa | 3000 | Nawabganj | N.E. Ry/M.G. | |
| Basti | 2500 | ,, | ,, | |
| Khalilabad | 2000 | ,, | ,, | |
| Babhnan | 3000 | ,, | ,, | |
| Balrampur | 3000 | ,, | ,, | |
| Tulsipur | 3000 | ,, | ,, | |
| Walterganj | 4000 | ,, | ,, | |
| Mairwa | 2500 | Sardarnagar | ,, | |
| Gauribazar | 2500 | ,, | ,, | |
| Baitalpur | 3000 | ,, | ,, | |
| Deoria | 2500 | ,, | ,, | |
| Pipraich | 2500 | ,, | ,, | |
| Anandnagar | 3000 | ,, | ,, | |
| Lakshmiganj | 2500 | ,, | ,, | |
| Ramkola | 7000 | ,, | ,, | |
| Bhatni | 3000 | ,, | ,, | |
| Padrauna | 3000 | Captainganj | ,, | In the event of the continued failure of the Captainganj disty. to work at full capacity a new unit may be located at Ramkola and adjustment made in movements. |
| Kathkuiyan | 2000 | ,, | ,, | |
| Seorahi | 3000 | ,, | ,, | |
| Ghugli | 3000 | ,, | ,, | |
| Siswabazar | 2000 | ,, | ,, | |
| Khadda | 2500 | ,, | ,, | |
| Chitauni | 2000 | ,, | ,, | |

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Bagaha | 2500 | Narkatiaganj | ,, | |
| Harinagar | 6000 | ,, | ,, | |
| Chanpatia | 3500 | ,, | ,, | |
| Sasamusa | 3000 | Hathua | ,, | |
| Harkua | 3000 | ,, | ,, | |
| Sidhwalia | 2500 | ,, | ,, | |
| Chakia | 3000 | ,, | ,, | |
| Savan | 3000 | Pachrukhi | ,, | |
| Goraul | 3000 | ,, | ,, | |
| Motihari | 3000 | Assansol/ Howrah | N.E. Ry/ F. Ry. | Transhipped at Mokameh or Barauni. |
| Sugauli | 3000 | ,, | M.G./B.G. | |
| Majhulia | 3500 | ,, | ,, | |
| Sakri | 2500 | Samastipur or Hasanpur | N.E. Ry/ M.G. | For a new distillery at either of these locations. |
| Riga | 2800 | | ,, | |
| Lohat | 4000 | | ,, | |
| Samastipur | 3000 | | ,, | |
| Hasanpur Road | 6000 | | ,, | |
| Guraru | 2500 | Bhagalpur | E. Ry/B.G. | |
| Bihta | 3500 | Ranchi | ,, | |
| Warsaliganj | 2500 | Ranchi | ,, | |
| Dalmianagar | 4000 | ,, | ,, | |
| Kolianur | 4000 | Nellikuppam | S. Ry/M.G. | |
| Tiruvannamalai | 2000 | ,, | ,, | |
| Vellore | 4000 | ,, | ,, | |
| Madurantakam | 4000 | ,, | ,, | |
| Pandavapuram | 4000 | Mandya | ,, | |
| Movements on C. Rly. | 10000 | ,, | C. Rly/ | It is difficult to forecast possible movements as the developments of alcohol industry is yet to take place and locations are difficult to decide, Overall requirements may be estimated at 15 B G. and 15 M. G. Wagons. |
| Other movements on S. Rly. | 10000 | ,, | S. Rly/ M.G. & B.G. | |

## APPENDIX IX

## EXPECTED MOVEMENTS OF ALCOHOL IN BULK (TANK WAGONS)

(As power alcohol or as industrial alcohol)

The Movements indicated are only approximate so as to enable assessment of tank-wagon requirements.

| Location of distillery | Qty. gallons/month Present | Qty. gallons/month from 58/59 | Present destination | Likely Destination from 58-59 | Quantity each Destination per month | Remarks |
|---|---|---|---|---|---|---|
| 1 | 2(a) | 2(b) | 3 | 4 | 5 | 6 |
| Khasa after shifting to Jagadhri | — | 50,000 | — | Amritsar | 20,000 | May go into production in 1958 and supplies to these depets from Daurala will be replaced. |
| | | | | Pathankot | 20,000 | |
| Hamira | — | 50,000 | — | Jullundur | 20,000 | |
| | | | | Ludhiana | 10,000 | |
| | | | | Ferozepur | 15,000 | |
| | | | | Kotkapura | 6,000 | |
| Karnal after shifting to Panipat | — | 40,000 | — | Hoshiarpur | 7,000 | |
| | | | | Hissar | 15,000 | |
| | | | | Ambala | 50,000 | |
| | | | | Saharanpur | 20,000 | |
| | | | | Kalka | 10,000 | |
| Pilkhani | — | 75,000 | | Dehra Dun | 15,000 | |
| | | | | Patiala | 8,000 | |

| 1 | 2(a) | 2(b) | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Mansurpur | — | 75,000 | Hoshiarpur<br>Jullundur<br>Amritsar | Bareilly | 1,000,000 | Existing movements will continue till the Butadiene plant goes into operation when the diversion will take place. |
| Daurala | 80,000 | 1,30,000 | Pathankot<br>Kalka<br>Ludhiana | | | |
| Meerut | 30,000 | 80,000 | Mathura<br>Rohtak or Hissar<br>Ferozepur | | | |
| Simohaoli | 60,000 | 60,000 | Delhi<br>Patiala<br>Kotkapura<br>Hathras | | | |
| Seohara | — | 80,000 | — | | | |
| Raja-Ka-Sahaspur | 50,000 | 80,000 | Ambala<br>Agra | | | |
| Rampur | 20,000 | 1,10,000 | Aligarh<br>Moradabad<br>Kotdwara | | | |
| Hargaon | 70,000 | 1,25,000 | Delhi<br>Lucknow | | | |
| Golagokarannath | 90,000 | 1,25,000 | Delhi<br>Ambala<br>Saharanpur | | | |
| Baheri | 70 000 | 1,25,000 | Dehra Dun<br>Bareilly<br>Kathgodam | | | |

| 1 | 2(a) | 2(b) | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| **Nawabganj** | 40,000 | 70,000 | Agra, Etawah<br>Mahoba, Jhansi | Lucknow<br>Kanpur | 40,000<br>30,000 | Re-adjustment to be made in 1958 when ACCI's polythene project gets started. |
| **Captainganj** | 60,000 | 90,000 | Lucknow<br>Kanpur<br>Gorkhpur | Allahabad<br>Banaras<br>Gorkhpur | 30,000<br>30,000<br>10,000 | |
| **Sardarnagar** | 90,000 | 1,10,000 | Banaras<br>Allahabad<br>Azamgarh<br>Mirzapur<br>Satna | Rishra<br>(Via Mokamah) | 1,10,000 | |
| **Hathua** | 60,000 | 60,000 | Patna<br>Gaya<br>Dinapur | Same<br>(Dhanbad omitted | 60,000 | |
| **Pachrukhi** | 40,000 | 40,000 | Muzaffarpur<br>Katihar<br>Bhagalpur | Same | 20,000<br>10,000<br>10,000 | |
| **Narkatiaganj** | — | 70,000 | — | Rishra<br>(via Mokamah) | 70,000 | |
| **Vijaiwada** | — | 60,000 | — | Sirpur<br>Kaghaznagar | 60,000 | Full requirements of Sirsilk at enhanced capacity and supplies for use as motor fuel. |
| **Bodhan** | 70,000 | 1,25,000 | Sirpur<br>Kaghaznagar | ,,<br>Secundrabad<br>Hyadrabad | 60,000<br>40,000 | |

| 1 | 2(a) | 2(b) | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Thumapala | — | 40,000 | — | Vizagapatam | 90,000 | For use in motor fuel or for export |
| Samalkot | — | 50,000 | — | ,, | | |
| Mandya | — | 60,000 | — | Mysore<br>Bangalore | 30,000<br>40,000 | For temporary use as fuel and later for cellulose acetate project |
| Hospet | — | 40,000 | — | Bangalore | 50,000 | |
| Nellikuppam | — | 50,000 | — | Cuddalur<br>Mayavaram<br>Tanjore<br>Trichinapoly | 90,000 | Use as motor fuel on temporary basis |
| Tanjore Dt (place to be specified late) | | 40,000 | | | | |
| Chitali | — | 200,000 | — | Bombay<br>Kalyan | 2,00,000 | For the National Carbon's Plant from 1958 and Acetate rayon |
| Kanhegaon | — | 40,000 | — | ,, | 40,000 | |
| Kolhapur | — | 60,000 | — | Belgaum<br>Sholapur<br>Satara<br>Poona | 1,00,000 | For use as motor fuel. |
| Diksal | — | 40,000 | — | | | |
| Ratlam | — | 20,000 | — | Indore | 20,000 | |

# APPENDIX X

## Proposals for technical control over Distilleries

The necessity for proper technical control and evaluation of the working efficiency of different units producing power alcohol has been repeatedly emphasised. The lack of adequate control was also pointed out by the members of United Nations Team of Experts who studied the working of Indian distilleries and held discussions in the ECAFE Seminar. A certain amount of technical control has no doubt been already envisaged under the State Excise Laws which are enforced in all distilleries, but such control measures are extremely inadequate for judging the standards of operation of modern distilleries. It has also been noted that certain additional controls have been prescribed by some of the State Governments for exercising a check on the working process of power alcohol distilleries. Some distilleries have also themselves taken the lead and are exercising adequate checks on their own production processes. It has been felt necessary to correlate all such efforts as have so far been made in different directions by different agencies and arrive at a uniform system of technical control over distilleries. Since the Power Alcohol Industry is a Central subject, and forms the most important sector of alcohol manufacture in India, it appears appropriate that such uniform methods are laid down by the Government of India and subsequently enforced throgh State Governments. Such controls may be enforced on power alcohol distilleries in the first instance, but the same procedure and system of control would be equally applicable to distilleries producing only industrial alcohol.

With the above object in view, an ad-hoc committee formed by the Development Wing of the Ministry of Commerce and Industry, have worked out a system of uniform technical control to be applied to distilleries. The Report is based upon suitable, precise and agreed definitions for the various technical terms and expressions used. These definitions and technical terms have been worked out mainly from the point of view of their practical utility. It has to be admitted that there might be room for certain differences of opinion both regarding the definitions and data to be reported. Differences also might arise in the final expressions of working efficiancies based on such data. A sincere effort has however, been made to lay down only the essential controls which are required for comparative purposes leaving sufficient scope to the distilleries in the adoption of processes for the various stages in their manufacture of power alcohol.

This Report contains a Proforma Run Report for recording the data relating to the daily working of the distilleries. This Report is divided into suitable sections relating to the number of operations involved in the production of alcohol in a distillery, namely (1) pre-treatment of molasses, (2) fermentation and (3) distillation. The minimum analytical data that are required have also been incorporated in separate sections of the Run Report and the methods for carrying out these analyses have been laid down. The last section of the Run Report relates to the efficiency data. While the distilleries are expected to maintain daily reports on the lines of the proforma run report, it would be necessary to compare only the figures in the last section, namely the efficiency data for assessing their comparative working. It might be useful to exchange the data under this section between the different distilleries so as to enable them to get acquainted with the working efficiencies of each other. A monthly report incorporating these efficiency figures may be submitted to the Government and the daily Run Reports prepared according to the proforma and maintained in the distillery would be the source for checking up the data from time to time.

Careful thought has been given in prescribing suitable methods for analytical determinations. Such methods as will facilitate acquiring the desired data with the required degree of accuracy in the least possible time have been considered and laid down. Attention has also been given to proper sampling where ever necessary. So far as tests on the quality of the product are concerned, methods aleady laid down under the Indian Standars specifications for Ethyl Alcohol have been adopted.

## SECTION I—DEFINITIONS

1. **Molasses**: For the propose of this Report, molasses is defined as the mother liquor left after removal of sugar crystals and usable as raw material foe the manufacture of alcohol.

2. **Total reducing sugars**: This represents the total reducing substances in molasses obtained by titration with Fehling's solution after hydrolysis and expressed as total invert sugar.

3. **Unfermentable Sugars**: Unfermentable sugars represent the quantity of reducing sugars contained in molasses after it has been completely fermented by yeast under specified conditions, again expressed as invert sugar

4. **Fermentable sugars**: Fermentable sugars shall be the difference between the total reducing sugars of molasses and unfermentable sugars.

5. **Brix**: This is density expressed on the brix densimetric scale and taken to represent the percentage of dissolved solid matter.

6. **Alcohol and Spirits**: For purposes of comparison, 100%. Ethyl Alcohol corresponding to the formulas C2H60 has been adopted as the standard for the product obtained. Spirits are the products of distillation containing alcohol.

7. **Strength of Spirits**: This represents the alcohol content of the spirits expressed in terms or degrees London proof or percentage of Alcohol by volume or by weight. For purposes of this Report, percentage of alcohol by volume has been adopted (Standard tables of densities of alcohol water mixtures are available for direct comparison and for arriving at strengths of spirits).

8. **Degrees Gravity**: This expresses the density in terms of the first three decimal figures of specific gravity when used for products of specific gravity greater than one.

9. **Wort**: This consists of a solution of molasses prepared for alcoholic fermentation or for yeast propagation (The degree gravity of a wort is related to the Brix of molasses used and the degree of dilution and enables back calculation of the quantity of molasses employed)

10. **Pitch or Bub**: This represents the charges of yeast suspension prepared for inoculating the main fermentation vats. No direct reference has has been made to the pitch in the proforma report as it may not be necessary (The sugars or molasses used in the proparation of the pitch will be expressed through the quantity of wort taken).

11. **Wash**: This represents the solution of molasses or wort during or after alcoholic fermentation.

12. **Sludge**: This is the residue of yeast and other materials which accumulates in the bottom of fermentation tanks along with such portion of wash as goes with it as is not taken for distillation.

13. **Sediment**: This represents the residue obtained after clarification or pre-treatment of molasses.

14 **Spent Liquors**: This is the residual liquid or liquids discharged after distillation of alcohol.

## SECTION II—PROFORMA REPORT.

.............................................................................Distillery

Run Report No.......................................for...................................

**Section 'A'** *Wort Preparation Record* *Date* *From* *Hrs. to Hrs.*

1. Quantity of molasses drawn ... Mds.
2. Brix of molasses drawn ... (Average in the case of variations).
3. (a) Wort made
   - (i) Yeast Propagators ... Gallons at—Bx
   - (ii) Bub ... Gallons at—Bx
   - (iii) Fermentars ... Gallons at—Bx
   - Total ... Gallons at average *Bx.
   - (b) Equivalent molases ... Mds.
4. (a) Sediment discharged after clarification. Gallons.
   - (b) Equivalent molasses ... Mds.
5. Ammonium sulphate ... Lbs.
6. Sulphuric Acid ... Lbs.
7. Other materials added, if any ... Lbs.

**Section 'B'** *Fermentntion House Record* *Date* *From* *Hrs. to Hrs.*

| | Record the data relating to each tank here. | Record the total or average in this column (as applicable). | **Remarks** |
|---|---|---|---|
| 8. Nos. of the wash tanks set up. | | | |
| 9. Quantity filled in galls. | | Total | |
| 10. Average gravity of set up, corrected for bub used... | | Average* | |
| 11. Final gravity of wash corrected to 81.5°F. ... | | Average* | |
| 12. Quantity of molasses used... Mds. | | Total | |
| 13. Duration of fermentation | | ... | |
| 14. Maximum temperature recorded ... | | ... | |
| 15. When distilled ... | | ... | |
| 16. Quantity of wash sent to still ... | | Total | |
| 17. Quantity of sludge discharged (by volume) ... | | Total | |
| 18. Alcohol % by volume in wash ... | | Average* | |

**Section 'C'** *Still House Record* *Date* *From* *Hrs. to Hrs.*

19. Total wash distilled—gallons. ... Same as (16) above.

20. Details of stoppages.

21. Production ... *D.A.* *R.S.* *Other Spirit* *Total*

(a) Bulk Gallons ...

Strength ...

Gallons of 100% Alcohol ...

(b) Production of fusel oil ... Gallons

22. (a) Rate of production D.A./R.S. ... Gallons/Hrs.

(b) Rate of Production total alcohol ... Gallons/Hr.

23. (a) Steam drawn for R.S. Section ... Lbs.

(b) Steam drawn for dehydration Section ... Lbs.

(c) Total steam for the plant ... Lbs.

24. Coal consumed ... Lbs.

} Total for the period.

25. Dehydrating agent consumed.

**Section 'D'** *Laboratory Record* *Date* *From* *Hrs. to Hrs.*

26. Total reducing sugars—% molasses ...

27. Fermentable sugars—% molasses ...

28. pH of molasses ...

29. F.S. in sediment after pre-treatment (lbs/Gall.)

30. Fermentable Sugars—in wash (Average)* ... Lb/Gallon.

32. Alcohol % in spent liquor (Average)* value reduced to the volume of wash distilled).

33. Quality of products ... D.A. R.S. Other spirits as prescribed by Government.

(a) Strength ...

(b) Acidity ...

(c) Residue on evaportion.

(d) Aldehyde ...

(e) Fusel Oil ...

34. Ash content % of molasses (Sulphated ash).

**Section 'E'** *Efficiency Date.* *Date or Period* *Distillation..............*

*Fermentation..............*

*Molasses Handling......*

| | | How arrived at |
|---|---|---|
| (a) Molasses drawn | Mds. | (1) |
| (b) Fermentable sugar drawn | Mds. | (a) × (27) |
| (c) Fermentable sugars in wort prepared | Mds. | 3(b) × (27) |
| (d) Total wash prepared (gallons) | | Total of (9) |
| (e) Fermentation recovery | | (d) × (31) gall. |
| (f) Total wash distilled (galls) | | (19) |
| (g) Total product obtained (galls) | | as 100% alcohol vide 21 a) |
| (h) Theoretical yield | | (b) × 5.3 (gallons of 100% alcohol). |
| (i) Loss of F.S. in pre-treatment | | $\frac{(a)-(c)}{(b)} \times 100\%$) |
| (j) Pre-treatment efficiency | | $\frac{(c)}{(b)} \times 100\%$ |
| (k) Fermentation efficiency | | $\frac{(e)}{(c) \times 5.30}$ |
| (l) Loss of F.S. in wash | | $\frac{(d) \times (30)}{(c) \times 82.3} \times 100(\%)$ |
| (m) Other fermentation losses | | 100 — (l) — (k) (%) |
| (n) Sludge losses | | $\frac{\text{Total of } (17)}{(d)} \times 100\%$) |
| (o) Distillation House efficiency | | $\frac{(g) \times 100\ (\%)}{(f) \times (31)}$ |
| (p) Loss in spent liquors | | $\frac{(32)}{(31)} \times 100\ (\%)$ |
| (q) Overall recovery | | $\frac{(g)}{(a)}$ gall. per md. molasses. |
| (r) Overall efficiency | | $\frac{(g)}{(h)} \times 100\ (\%)$ |
| (s) % of Dehydrated Alcohol to total | | (From 21 a) |
| (t) Steam consumed lbs/gallons | | lbs. $\frac{23(c)}{(g)}$ |
| (u) Coal consumed lbs/gallons | | lbs. $\frac{24}{(g)}$ |
| (v) Dehydrant consumed | | $\frac{25}{21\ (a)}$ (D.A.) |

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* See Explanatory Note at (C).

## SECTION III—EXPLANATORY NOTES.

### (a) Quality of molasses.

The working results of a distillery invariably depend upon the quality of molasses available to it. We have only indicated the quality of molasses used at distilleries in terms of their fermentable sugar content and subsequent data are based on this figure. According to present information, the fermentation efficiencies of distilleries are invariably proportional to the fermentable sugar content of molasses used and cannot be easily correlated with other data like the pH or ash content. It is however proposed to include data on pH and Ash Content in the section on 'Laboratory Data' with a view to evaluate suitable correlation between recovery on fermentable sugars and the ash content of molasses at a future date. The use of other raw materials has been envisaged. but the system of control discussed in the Report could be equally made applicable to other raw materials.

### (b) Recording of Data.

A source of difficulty which arises in the presentation of technical data of a distillery occurs due to a certain time lag between the different processes corresponding to the same unit of the raw material. The production of alcohol reported on a particular day does not pertain to the fermentation process carried out on that day nor to the molasses handled at that particular period. There is generally a time lag of a few hours between the preparation of molasses and its fermentation and a further time lag of 36 to 60 hours between its fermentation and the distillation of the corresponding product. The present system of excise control in some States involves the taking of out turns corresponding to a set of wash tanks set up during the period of 72 hours or so. There might be difficulty in exercising control on these lines in cases where fermentation or distillation is interrupted due to unforeseen causes and the Committee has felt that it would be desirable if the production in every 24 hours is recorded as far as possible. We have, therefore, laid down that the production and other data recorded in the Run Report for a particular day shall correspond to a set of fermentation tanks distilled completely as far as possible in previous 24 hours. Where, in cases of emergency, it is found necessary to record the production during the course of distillation of a particular wash tank, the actual contents of the tank distilled should be put down in the Report in the appropriate columns and utilised in the calculation of the quantity of molasses corresponding to the alcohol production. The quantity of molasses corresponding to each fermentation tank set up is arrived at on the basis of the quantity of wort filled in and its brix as compared to the brix of molassas used. In rare cases, where weighed quantities of molasses are transferred separately to each fermentation tank, this system of back calculation will not be necessary. There may not be any serious difference between the quantity of molasses actually weighed and the quantity arrived at by back calculation from Brix. It will also be noted that when the consolidated monthly report on efficiency data is compiled, the differences caused by the time lag would tend to disappear.

### (c) Determination of averages.

The term "Average" used in the proforma means the statistical average worked out in terms of the quantities of different tanks or lots and values for each tank or lot. As an example, the four tanks containing say 10,660 gallons of 7.2% alcohol 10,640 gallons of 6.9% alcohol 10,280 gallons of

Similarly, in the case of wort, the statistical average of different dilutions at varying brix made during that period is worked out.

**(d) Quantity of molasses darwn** :

This represents the quantity recorded by weighing scales in the distillery prior to the treatment of molasses.

**(e) Molasses clarification** :

The equivalent molasses in the wort prepared is worked out in cases where the molasses is pre-treated. The quantities of sediment discharged after such pre treatment is also recorded and can form a means of verifying the pre-treatment efficiency through its sugar content.

**(f) Quantities of wort and wash** :

The quantity of wort filled into each fermentation tank including the bub transferred is recorded on the basis of the calibration charts for that tank. Similarly, the wort made is recorded on the basis of the molasses dilution tanks. The quantities of wort made and the quantities of wort filled into fermentation tanks should tally for corresponding periods except for occasional wastages and leakage.

**(g) Details of Wash distilled** :

As we have explained at (b) the report should correspond to a certain number of wash tanks (set up on the previous day or days) and distilled on the reporting date. Section 'B' should therefore, indicate the data relating to the tanks which were distilled and the date and time indicated in Section 'A' should correspond to the period when these tanks were set up. The details of wash distilled and the total quantity at (19) would therefore, correspond to the data under (16.) In case a tank has been distilled in part, this may be indicated against (16.)

**(h) Alcohol in Spent liquor** :

Proper care has to be taken in the sampling of spent liquors for analysis, particularly in cases where the conditions of distillation are not stable. Where there are separate discharges of spent wash and spent lees, samples of each are to be taken and analysed separately. The alcohol content has to be finally expressed as percentage of the quantity of wash distilled. This could be done on the basis of the increase in volume of spent wash or of total spent liquors as compared with the volume of wash charged into the still. Where separate samples of spent wash and spent lees are analysed, a composite value should be arrived at for 'spent liquors' based upon the relative percentages of alcohol and the volumes of spent lees and finally reducing to the volume of wash distilled. As far example, 1600 gallons wash is being distilled per hour. Spent wash indicates, an alcohol content of 0.2% and spent lees of 0.25%. Rate of discharge of spent wash works out to 1960 gallons per hour and spent lees 175 gallons per hour. Alcohol % spent liquors is, therefore :

$$\frac{1960 \times 0.2 + 175 \times 0.25}{1600} \text{ or } 0.27\%$$

**(i) Expression of gravity** :

Gravity is expressed after correction to a standard temperature namely 81.5° F.

### (j) Attenuation :

We have avoided reference to Attenuation in the Report since this appears to be a purely empirical term. Degree of attenuation, being the proportion of actual attenuation to the original gravity of the wort, is some times useful in assessing the success of the fermentation. Similarly, degree of attenuation divided by the fermentable sugar content of molasses may be a useful standard of comparison for fermentation efficiency irrespective of the quality of molasses. However, suitable criteria have not yet been evolved for this purpose. Correspondingly, the "Attenuation ratio" usually recorded in accordance with Excise Regulations, represents attenuation achieved divided by proof gallons of alcohol recovered for 100 gallons of wash and is also a useful empirical guide for distillation efficiency. In view of the fact that more accurate expressions to indicate the fermentation or distillation efficiencies have been incorporated in the Report, empirical terms like degree of attenuation and attenuation ratio have been avoided. There is, however, no objection to these data being recorded by distilleries so as to serve as a rough and ready check on working efficiency without waiting for complete laboratory data.

### (k) Theoretical Yield :

The "Pasteur co-efficient" has not been taken into consideration in arriving at the quantity of alcohol obtainable on the basis of unit weight of sugar. Calculations are based taking the alcohol yield as 51.1% corresponding to 5·30 bulk gallons of 100% alcohol per maund of invert sugar. There might be some small diversion of the sugar during fermentation for by products like Succinic acid, Glycerol etc., but it has not been considered necessary to make any correction on this account.

### (l) Total percentage Alcohol by Volume :

The percentage by volume of 100% alcohol as measured at 60°F contained in the spirits obtained is computed from specific gravity or proof strenght determinations by the use of standard Tables.

## SECTION IV—Methods of analysis

### 'A' Molasses.

#### 1. Stampling of Molasses.

In general, the samples of molasses for test should be collected at the same time as and when its weight is determined. The best method of doing this is by means of a hole in the drain from the weighing installation and putting a container underneath, about 2 lbs., being collected for every weighing as a gross sample. The samples from each batch may be composited over a period of 24 hours and a composite sample taken for analysis. Where batches weighed are not of uniform weight, quantities proportionate to the total weight of each batch must be used in compositing. The collected sample is transferred completely to a wide basin, stirring it so as to prevent any settled solids from remaining over. 500 gms of the sample are finally taken for analysis.

#### 2. Determination of Brix of molasses.

(From the Manual for Manufacturing Control in sugar factories published by the Sugar Technologists' Association of India, Kanput, 1939—Page 47).

In the case of products of low quality, such as waste molasses, it is not possible to determine the solid content or moisture content directly by drying at 100°C since partial decomposition of the material is likely to take place. In these cases, the brix is determined by preparing a solution of 300 gms. of the material in 1200 gms. of cold distilled water. After the material has been completely dissolved the brix is determined using a brix hydrometer fitted with thermometer and of range 10 to 20° standardised at a temperature of either 20°C or 27.5°C. After applying the correction factor for difference in temperature, the percentage of solids in the solution is obtained from appropriate tables. The corrected brix df the original molasses is obtained by multiplying the results by 5.

(Note :—The true solids of a final molasses may be from 5 to 10% below the value indicated by dilution end spindling and differences are possible depending upon the degree of dilution employed. It is, therefore, necessary to adherto to the same degree of dilution in each case and the dilution of 1 to 5 is recommended as standard).

#### 3. Determination of Total Reducing Sugars :

The Lane and Eynon's volumetric method is preferred in distillery practice since a large number of samples have to be handled in the shortest possible time. The method is sufficiently reliable and can give accurate and reproducible results in the hands of a trained operator and the more cubersome gravimetric or other alternative methods have, therefore, not been indicated.

**(a) Reagents required :**

**(i) Fehlings' Solution, Soxblets' modification :**

**Solution 'A'**—34,639 gms. of pure crystallised copper sulphate (CuSo4. $5H_20$) are dissolved in distilled water and the solution made up to 500 mls. (If the solution is not clear, it is filtered through purified abestos).

**Solution 'B'**—173.0 gms. of Rochelle Salt (Sodium Potassium Tartarate, $KNaC_4H_40_6$-$H_20$) are disolved in 300 mls. of water and transferred into a measuring flask of 500 ml. capacity. 50 gms. of pure sodium hydroxide (NaOH) are dissolved in 100 mls. of water and the solution added to the measuring flask. After cooling, the volume of the mixture is made up to 500 mls. with water. The solution is allowed to stand for 2 days, and then filtered through purified asbestos. The alkalinity of the solution so prepared should be such that 10 mls. of the same would require about 200 mls of N/1 acid for titration using phenolphthalein as indicator.

The Fehlings' solution for use in the method is prepared by mixing equal volumes of solutions 'A' and 'B' just before the titration.

(ii) **Standard Invert sugar** solutions containing 2mg. Invert sugar per ml, (see below).

(iii) **Methylene Blue Solution** : 1 gm. of Methylene Blue dissolved in distilled water and finally made up to 100 mls.

(iv) **Neutral Acetate Solution:** 100 gms. of Lead Acetate (Pb. $(CH_3Coo)_2.3H_20$) are dissolved in distilled water and the solution made up to 1000 mls.

(v) **Sodium PhosphatePotassium Oxalate Solution :**

70 gms. of Disodium hydrogen phosphate, Dodecahydrate ($Na_2HPo_412H_2o$) and 30 gms. of Potassium Oxalate crystals ($K_2c_20_4$. $H_2o$) are dissolved in water and the solution made up to 1000 ml.)

### (b) Preparing of the Molasses Solution :

12.5 gms. of molasses, accurately weighed, are transferred with the aid of distilled water to a 250 ml. meanuring flask, and treated with 25 mls. of undiluted (10%) neutral lead Acetate Solution for clarification. The flask is filled up to the mark and the contents are mixed carefully and then filtered. The first few mls. of the filtrate are rejected, and 100 mls. of the clear filtrate are transferred to a 500 ml measuring flask, and 10 mls. of sodium Phosphate-Potassium Oxalate mixture are added. The contents of the flask are then made up to the 500 ml. mark with water and after shaking the liqu,d is filtered off. The first few mls. of the filtrate are again rejected and the clear filtrate collected subsequently is used in the preparation of Invert molasses solution.

### (c) Preparation of the Invert molasses solution :

(Sugar analysis of BROWNE AND ZERBAN P. 407) Pipette a 50 mls. portion of the molasses solution into a 100 ml. flask and add 25 ml. of water. Then add little by little to the mark. Leave the flask in the bath at 20°C for at least 30 minutes longer and finally make up exactly to volume and mix well.

(Herzfelds' inversion proceduce as standardized by Schrefeld and adopted as official method by A.O.A.C. for products not containing much fructose).

Note : Inverison with acid is preferred. There is no objection to the use of invertase preparations where standard preparations are available.)

**(d) Lane Eynon's Volumetric titration—for estimation of total reducing sugars.**

The solution prepared is of such a strength that it will contain from 0.25 to 0.8 gm. of reducing sugars per 100 ml. if molasses solution prepared as directed in 3(b) and subsequently inverted as directed in 3(c) is used for the determination.

**Standard method of procedure :**

5 mls. each of the Fehling' solutions 'A' and 'B' are measured into Erlenmayer flask of 300 to 400 ml. capacity and treated in the cold with almost the whole of the sugar solution required to effect reduction of all the copper, so that if possible, no more that 1 ml. is required later to complete the titration (The approximate volume of sugar solution required is ascertained by a preliminary titration). The cold mixture is heated over a wire gauze; after the liquid has begun to boil, it is kept at a moderate ebullition for two minutes, and then without removal of the flame, three to five drops of methylone blue indicator are added, and the titration is completed in one minute further, so that the reaction liquid boils altogether for three minutes without interruption.

The indicator is so sensitive that the end point can be determined to within one drop of the sugar solution in most cases. The complete decolorisation of the methylene blue is usually sufficiently well indicated by the whole reaction liquid, in which the cuprous oxide is constantly churned up, becoming bright red or orange in colour, but if there is any doubt, the flask may be removed from the wire gauze for a second or two and held against a sheet of white paper on the bench when the edge of the liquid will be bluish if the indicator is not completely decolorised. The boiling should not be interrupted for more than a few seconds so as to avoid back oxidation of the indicator.

To ascertain the volume of sugar solution required approximately in order to carry out the procedure as above, a pseliminary titration is usually necessary This is carried out more or less on the above lines so that the required quantity can be ascertained to the nearest ml.

(Note : Since the accuracy of the method depends on the amount of copper taken, great care must be exercised in measuring this reagent Fehlings' 'A')

**(e) Standardisation of the Fehlings' Solution:**

Small deviations in the strength of the mixed Fehling's solntion may arise from variations in individual procedure and composition of the copper salt used in preparing the Fehling's solution. In order to eliminate error from this source, it is recommended that the Fehling's solution should be standardized once each day, against a standard invert sugar solution prepared from dry refined sugar as follows :

Exactly 9.50 gms. dry refined cane sugar is dissolved in 50 mls. of water and treated with 5 mls. of con Hcl (sp gr-1.19). The resultant mixture is made upto 100 ml. and allowed to stand for three days at a temporature of not less than 20°C and then made up exactly to 1 litre without neutralising. This acidified 1 percent invert sugar solusion is very stable and will keep for months (A.O.A.C. Edition, Page 506).

For the standarization, 50 mls. of the acidified 1 per cent Invert sugar solution prepared as above is carefully neutralised with 1% aq. NaoH solution drop by drop until the reaction is still very weakly acidic. In actual practice, it is convenient to separately titrate the 5 mls. of the conc Hcl used for inverision with the 1% solution of NaoH and if one finds that 40 ml. of the alkali are required for the neutralisation, then only slightly less than half this volume (19 mls.) of the NaoH solution are used for neutralisation of the 50 mls. of the acidified invert solution. After neutralisation. the invert sugar solution is made up to 250 mls. with distilled water. This dilute invert sugar solution contains 9.5 × 20/19 × 50/2000 × 1/1000 = 2 mgms. of Ivert sugar per ml. Proceed to run the titration as described above using this solution and 10 mls of the mixed Fehling's solution as described above.

If the Fehling's solution had been of accurate strength, 10 mls. of the same would require 25.64 mls. of Invert sugar solution while the actual strength is obtained from the figure 25.64/a where (a) is the number of mls. iuvert sugar solution (cotaining 2 mgms. per ml.) actually consumed for the titration of the Fehling's solution (Mannual of manufacturing control of Sugar Factories, S.T.A. Kanpur – P.69).

### (f) Calculations

By a reference to prescribed Tables, it is possible to calculate the amount of total reducing sugars—calc. as invert sugar—in 100 mls. of invert molasses solution from the volume of soln, used in the titration and from this figure, the percentage of total reducing sugars in the sample of molasses started with is arrived at as shown in the following example :—

Let 19.43 mls. of the inverted molasses solution be used for complete precipitation of the copper contained in 5 ml. of Fehling's solution 'A' and let 26 23 mls. of standard Invert sugar solution (2 mg. per ml) correspond to 10 ml. of the Fehling's solution. The Fehling's solution is therefore, too concentrated requiring a correction factor of 25 64/26.23. The corrected figure for titration with 10 mls. of Fehling's solution of proper strength is therefore, 19.43 × 25.64/26 23 = 18.99 mls. of Invert molasses solution. From the table, one finds that the invert sugar content per 100 mls of the solution is 282 – (0.99 × 15) = 267.15 mg. As 100 mls. of this solution corresponds to 0.5 gms. of the original molasses, the percentage of total reducing sugars in the molasses $= \frac{267.5 \times 100}{0.5 \times 100}$ = 53.43% or roughly 53%.

### 4. Determination of percentage of sulphated Ash—

(Methods of sugars Technologists' Association of India Kanpur, Pages 46—47).

In a well cleaned quartz crucible, approximately 5 gm. of molasses are weighed out quickly, but accurately to 3 decimal places. 2 mls. of concernted sulphuric acid are added and the crucible is then placed on the top of a hot-water even or over a hot-water-bath. The mass gets charred while at the same time, swelling largely

When volume of the charred mass does not increase any longer, the heating of the crucible is continued over a small flame (heat to be applied very carefully to prevent spurting) until the vapoure of $SO_2$ and $SO_3$ are no longer evolved. The heat is then increased till the crucible shows a red hot glow and pinkish grey ash is obtained, (where possible, it is advisable to use a small muffle oven maintained at a temperature of 550-600°C). In order to reconvert the sulphate which may often get reduced during the heating process, the ash is again carefully moistened with some sulphuric acid (1 : 1). The excess of driven off by heating carefully so as not to reach too high a temperature.

The crucible is then cooled in a dessicatar and weighed and the contents reduced to constant weight.

(Weight of crucible plus ash)—weight of empty crucible x 100
(Weight of molasses taken in crucible).

### 5. pH of molasses.

pH determinations by colorimetric methods using indicator solutions are unsuitabie for low grade products such as molasses solution or of wort and wash. Electrometric methods using glass electrodes such as the Coleman PH electrometer or those marketed by Leeds and Northrup, Cameron, Hellinge, Backmann Pyc etc. are more suitable. As outlines of the procedure are supplied by the suppliers of the instruments, these are not indicated here. For uniformity, the pH of a solution of molasses, diluted with four times its weight of water should be reported.

### 6. Determination of unfermentable reducing substances in molasses.

For computing distillery efficiencies, this is one of the most important determinations. A number of different methods are available based upon fermentation of the molasses under standard conditions and determining either the alcohol produced, the carbon dioxide lost or the reducing sugars left behind in solution. While the determination of loss in weight due to carabon dioxide may indicate accurately the amount of fermentable sugars present in molasses, the method is rather cumbersome and we have, therefore, recommended the procedure which involves fermentation under standard conditions and estimation of the reducing sugars left behind. The methods for the fermentation of molasses also vary and involve either using a large quantity of standard Baker's yeast available in the market or of growing sufficient quantity of yeast from the standard culture used in the distillery. In view of the fact that Baker's yeast is not generally available in the country and more particularly at the locations of distilleries, we have to recommend the method involving the use of the dittilleries strain of yeast with the proviso that in the event of any dispute, a specified standard culture from the National Laboratories may be employed under the same conditions. Methods of estimation for the reducing sugars left behind also vary and the A. O. A. C. recommends the Iodimetric method for this determination in view of the small quantities of sugars present. However, the Lane Eynon method of titration is also likely to give correct resuits provided the initial concentration of molasses is adjusted so as to give a final sugar concentration of 100 to 300 mgms. in 100 mls. after fermentation. It may not ordinarily be difficult to determine the end point of titration with sufficient accuracy. Where the distilleries prefer to adopt the Iodimetric method, we have no hesitation in recommending the same.

#### (a) Method using Baker's Yeast :—

Transfer 12.5 gms, of the molasses to a 400 ml. Erlenmayer flask using 75 ml. of water. Add 25 gms. of fresh yeast, cearsely chopped and mix thoroughly with the molasses solution, close the flask with a stopper provided with a delivery tube, the other end of which dips about 1 mm. below the surface of water in a beaker. Place the flask in a thermostat kept at 30°C. and allow the fermentation to take place for 4 hours, shaking the flask from time to time The flask may be left overnight, if necessary. When the fermentation is complete, transfer the liquid to a 250 ml. standard flask, treat with 25 C.Cs of neutral load acetate solution and make up the mark at 20°C and filter ; discard the first runnings and collect 200 mls. of subsequent filtrate in another 250 ml. standard flask. Add 10 ml. of sodium phosphate-potassium oxalate mixture and make up with water to the 250 ml. mark. After shaking, the liquid is filtered and the clear filtrate collected is used for the determination of unfermentable reducing substances by the Lane Eynon or other method. 100 ml. of this filtrate correspond to $\frac{12.5}{250} \times \frac{200}{250}$ or 4 gms. of molasses.

### (b) Method using pure culture of distillery yeast :—

Take 62.5 gms of the molasses sample into a 1 litre glass beakar. Dissolve the molasses in 400-500 ml. of tap water and add sufficient 2N sulphuric acid to bring the PH to 4.4-4.6. Add 25 ml. of a solution containing 40 gms. per litre of diammonium phosphate brought to PH 5 by sulphuric acid. Transfer to all litre standard flask and make up to the vnlume. Into each of two 750 ml. Erlenmayer flasks, transfer exactly 400 ml. of the wort prepared above. Also add 4 drops in addition in order to compensate for loss during subsequent transferences. From each of the 750 ml. flask, pipette out 2 mls and 20 mls. respectiveiy fnto separate test tubes and 100 ml. Erlenmaydr flasks. Fit the flasks and test tubes loosely with cotton wool and steam them in a steriliser at atmospheric pressure for one hour. Cool the test tubes and inoculate them with a pure culture of the yeast used in the distillery taking precautions to avoid infection. It is, however, desirable to use a standard culture wherever possible or in the event of a dispute. Piace the tubes in an incubator at 30°C and allow to grow for 24 hours. Then transfer the contents of the test tubes to the corresponding 100 ml. flasks and again ferment in an incubator for 24 hours before transfering the content finally to the corresponding sterilised 750 mi. flask. Keep the loose cotton plug and ferment for 2 to 3 days, swirling the flask gently once eaeh day The incubator should be kept at 30°C, in which case the fermentation is expected to be complete within 48 to 72 hours. The contents of each 750 ml flask are then transferred to separate 500 ml. standard flasks to which 25 ml of neutral load acetate solution are added. Make up to the mark and filtar, discarding the first runnings. Collect 200 ml. of the subsequent filtrates from each flask separately into 250 ml. standard flasks. Add 10 ml. of phosphate oxalate solution to each flask and make up to the 250 ml marks. After shaking, filter and estimate the reducing substances in the clear filtrates. Duplicate titrations are performed from each of the flask and should not differ more than 2%. 100 ml of the final solution corresponds to 4 gms of molasses.

### (c) Alternate mathod of estimation of reducing sugars by Iodimetric methods :

50 ml of the final solution prepared for estimation is diluted to 100 ml with distilled water and 25 ml of the diluted solution transferred to and Erlenmayer flask and mixed with 100 ml of each of the Fohling's solutions A & B. Wash the walls of the flask down with 5 ml water, and a few pieees of pumice stone and place the flask over a wire gauze. Heat and bring the mixture to boil in three minutes and boil gentle for exactly two minutes longer. Close the

flask immediately with stopper provided with Bunsen value and cool quickly under water tap to prevent re-oxidation of the cuprous oxide. Add 15 ml of a 20% solution of potassium iodide in water and then 10 ml of dilute sulphuric acid (1 : 3). Titrate atonce against n/10 standard thiosulphate adding starch indicator towards the end. Run a blank with the reagents and yeast omitting the molasses. The corresponding quantities of Invert Sugars can be obtained direct from the appropriate tables.

*Note :*

> In view of the fact that 5 to 6 days are required in the estimation of fermentable sugars of molasses, it may not be practicable to obtain the fermentable sugar value of every day's supply of molasses for the purposes of this Report. In such cases, it is suggested that composite samples of molasses for periods up to a week may be obtained and the fermentable sugars and total sugars determined. The fermentable sugars could then be expressed as proportion of total sugars in the composite sample. This proportion may then be applied to the total reducing sugars of each day's sample of molasses in arriving at its fermentable sugar content.

## 'B' ANALYSIS OF THE FERMENTED WASH.

7. **Percentage of the unfermented sugars :**

The same procedure subsequent to the fermentation under 6(b) above may be followed for titration of the unfermented reducing sugars in 400 ml. of wash.

8. **Spirit Content :**

Transfer 250 ml. of the sample to the flask used with the Thorpe-Holmes Revenue still or other suitable distilling apparatus after noting down the temperature to the nearest 0.5°F. Add 50 ml. of water and a few mgms of solid Phenolphthalein powder and 5 gms. of salt (Nacl) and then add 4% NaoH till the liquid reacts just as alkaline. Connect the flask to the still and distil, receiving the distillate in a standard 250 ml flask containing a few mls. of water. The delivery dube of the condenser should be dipped under the surface of the water in receiving flask. The distillate is collected until the volume is close to 250 ml mark. The flask is then stoppered; the contents thoroughly mixed and cooled for 30 minutes to bring to the temperature of the wash used. Then make up to the volume with distilled water. The distillate is tested to see that it is free from alkalinity. In case it is alkaline, a second distillation after acidification, with dilute sulphuric acid is necessary. The specific gravity of the distillate is then determined by use of a 50 ml. pyknometer or a specific gravity bottle. When a specific gravity bottle is used, the density of distilled water at the same temperature as of distillate is also determined to arrive at the specific gravity at the particular temperature and specific gravity at 60°F is arrived at on the basis of standard data. When a 50 ml. pyknometer is used, the weight of spirit contained in the pyknometer is multiplied by 20 and a correction as per Table VI is applied to arrive at corrected specific gravity at 60°F. The alcohol content is arrived at from the specific gravity at 60°F by use of appropriate Tables.

## 'C' ANALYSIS OF FINISHED PRODUCTS.

9 The tests for dehydrated alcohol and rectified spirit, follow the same procedures described in the Indian Standard Specifications for these times.

## 'D' ANALYSIS OF SPENT WASH.

10. The percentage of alcohol by volume calculated at 60°F is obtained on 500 ml. of the material distilled in accordance with the procedure already described under 'B' above. Collect only 100 ml. of the distillate, cool, make up to the volume at the same temperature and determine the specific gravity. The percentage of alcohol thus obtained is divided by 5 to give the value for the spent wash with sufficient accuracy. Great care should be taken to obtain representative samples of spent wash, particularly when only one determination is made in the course of the day. The samples obtained should moreover not be exposed to the atmosphere at any time before cooling so as to avoid loss of alcohol.

The volume of spent wash is generally higher than the volume of wash sent for distillation on account of the steam condensed. A small portion of the water also gets removed along with the alcohol. While a detailed calculation or measurement of the rate of discharge would be necessary to arrive at the proportion of spent liquors discharged in each distillery corresponding to 100 gallons of wash distilled, on average approximate value may be taken at 125% of the volume of wash distilled. In expressing the alcohol content of spent wash, the value determined as above has to be multiplied by 100/125 or such other fraction as may be arrived at by the distillery.

Determination of alcohol content using standard makes of Ebullometer may give fairly accurate results in the case of liquids, with low percentages of alcohol like spent liquids, but great care has to be exercised in the setting of the instruments and in the actual procedure followed. Where distilleries have used such standard Ebulliometer with consistent results which tally with values obtained by distillation method, there is no objection to its being adopted in recording data for alcohol content of spent liquors.